

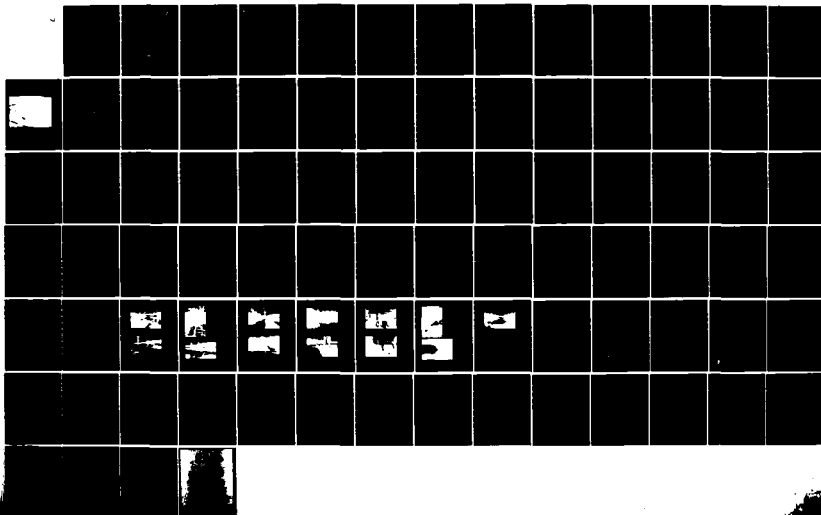
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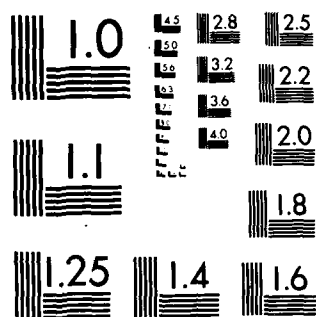
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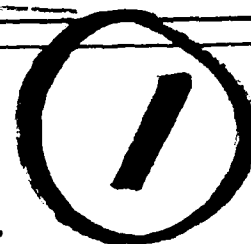




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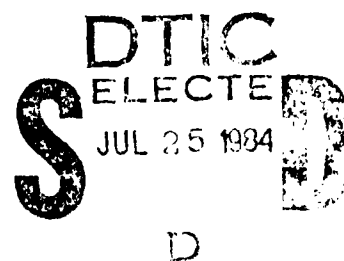
THAMES RIVER BASIN  
KILLINGLY, CONNECTICUT



OLD DANIELS DAM  
CT. 00168

PHASE 1 INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS.  
AUGUST, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Thames River Basin Killingly, Conn. Old Daniels Dam		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Old Daniels dam is an earth embankment structure with a stone masonry concrete spillway. The dam is 18 ft. in height and approx. 346 in length (including the spillway). The dam is considered to be in FAIR condition. The dam is classified as SMALL in size and a SIGNIFICANT hazard structure in accordance with recommended guidelines established by the Corps of Engineers. The test flood adopted for OLD DANIELS DAM is equal to one-half the PMF.		



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02254

REPLY TO  
ATTENTION OF:

NEDED

7 OCT 1980

Honorable Ella T. Grasso  
Governor of the State of Connecticut  
State Capitol  
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Old Daniels Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Sactchidananda Ashram-Yogaville, Inc., Pomfret Center, Connecticut.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

*Max B. Scheider*  
MAX B. SCHEIDER

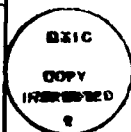
Colonel, Corps of Engineers  
Division Engineer

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OLD DANIELS DAM

CT 00168



THAMES RIVER BASIN  
KILLINGLY, CONNECTICUT

PHASE I - INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NAME OF DAM: Old Daniels Dam  
ID NUMBER: CT 00168  
COUNTY & STATE: Windham County  
Connecticut  
STREAM: Five Mile River  
DATE OF INSPECTION 2 April, 1980

BRIEF ASSESSMENT

Old Daniels dam is an earth embankment structure with a stone masonry concrete spillway. The impoundment was formerly used for industrial power and process water, but is now used for recreation only. The dam was constructed around 1880. The dam is 18 feet in height and approximately 346 feet in length (including the spillway). The stone masonry concrete cap spillway has a crest length of about 112 feet. The outlet works is located approximately 30 feet from the right spillway abutment and consists of a stone masonry lined approach channel, a concrete intake structure which houses three manually operated wooden gates, and a concrete lined stone masonry arched outlet conduit. The sluice gates were rehabilitated in 1966.

*rehabilitated*

The dam is considered to be in FAIR condition. Deficiencies include lack of riprap on the upstream slopes, large trees on the embankment slopes near the retaining walls of the spillway discharge channel, and the partly collapsed stone wall on the left bank of the spillway discharge channel.

The dam is classified as SMALL in size and a SIGNIFICANT hazard structure in accordance with recommended guidelines established by the Corps of Engineers. The test flood adopted for OLD DANIELS DAM is equal to one-half the Probable Maximum Flood (PMF) which is estimated to be 10,240 CFS from the 51.2 square mile drainage basin. Calculations indicate that the routed test flood outflow of 10,150 CFS (200 CSM) would overtop the dam by about 3.53 feet, therefore the spillway capacity is considered inadequate. Assuming the pool elevation at the top of the dam, the spillway can pass a flow of 1920 CFS which represents only 19 percent of the routed test flood outflow.

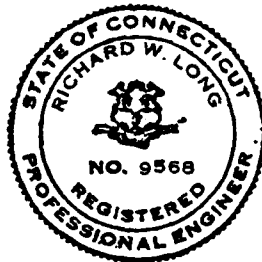
It is recommended that the owner engage the services of a registered Engineer experienced in the design of dams to accomplish the following:

Perform detailed hydraulic and hydrologic studies to further assess the need for and means to increase the project discharge capacity, place riprap on the upstream slope of the embankment to prevent further sloughing and erosion remove trees growing on the embankments, repair the spillway discharge training walls. The above recommendations and other remedial measures as described in Section 7 should be implemented within one year after receipt of this Phase I Inspection Report.

CE MAGUIRE, INC.

By:

*Richard W. Long*  
Richard W. Long  
Vice President





This Phase I Inspection Report on Old Daniels Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER  
Design Branch  
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER  
Water Control Branch  
Engineering Division

Aramast Mahtesian

ARAMAST MAHTESIAN, CHAIRMAN  
Geotechnical Engineering Branch  
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR  
Chief, Engineering Division

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, DC 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or to property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain condition which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
LETTER OF TRANSMITTAL	
BRIEF ASSESSMENT	
REVIEW BOARD PAGE	
PREFACE	i
TABLE OF CONTENTS	ii
OVERVIEW PHOTO	
LOCATION MAP	

## REPORT

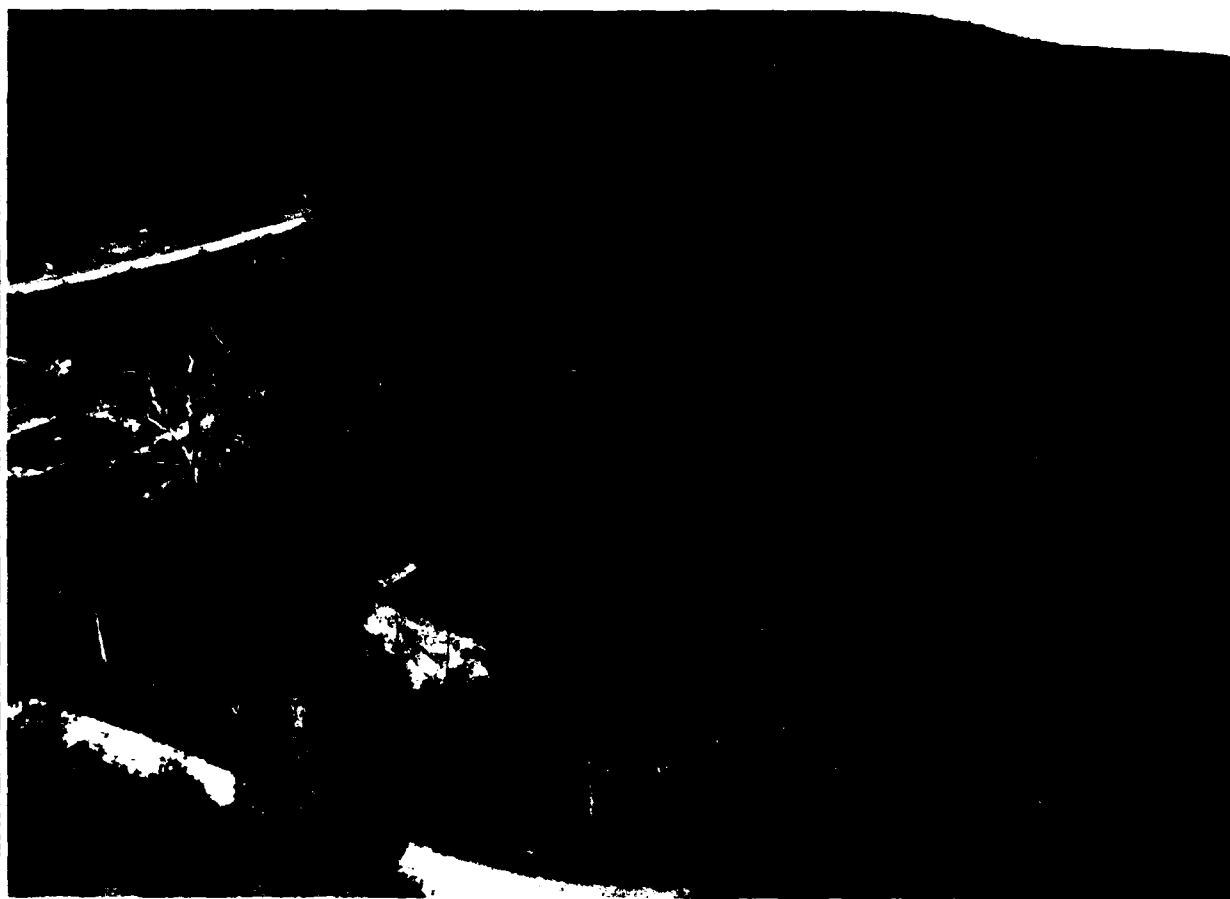
1. PROJECT INFORMATION	
1.1 General	1-1
a. Authority	1-1
b. Purpose of Inspection	1-1
1.2 Description of Project	1-1
a. Location	1-1
b. Description of the Dam and Appurtenances	1-2
c. Size Classification	1-2
d. Hazard Classification	1-2
e. Ownership	1-2
f. Operator	1-2
g. Purpose of the Dam	1-2
h. Design and Construction History	1-2
i. Normal Operational Procedures	1-3
1.3 Pertinent Data	1-3
a. Drainage Area	1-3
b. Discharge at Damsite	1-3
c. Elevations	1-4

<u>Section</u>	<u>Page</u>
d. Reservoir Lengths	1-4
e. Storage	1-5
f. Reservoir Surface	1-5
g. Dam	1-5
h. Diversion and Regulating Tunnels	1-6
i. Spillway	1-6
i. Regulating Outlets	1-6
2. ENGINEERING DATA	
2.1 Design Data	2-1
2.2 Construction Data	2-1
2.3 Operation Data	2-1
2.4 Evaluation of Data	2-1
a. Availability	2-1
b. Adequacy	2-1
c. Validity	2-1
3. VISUAL INSPECTION	
3.1 Findings	3-1
a. General	3-1
b. Dam	3-1
c. Appurtenant Structures	3-2
d. Reservoir Area	3-3
e. Downstream Channel	3-3
3.2 Evaluation	3-3
4. OPERATIONAL PROCEDURES	
4.1 Operational Procedures	4-1
a. General	4-1
b. Description of any Warning System in Effect	4-1
4.2 Maintenance Procedures	4-1
a. General	4-1
b. Operating Facilities	4-1

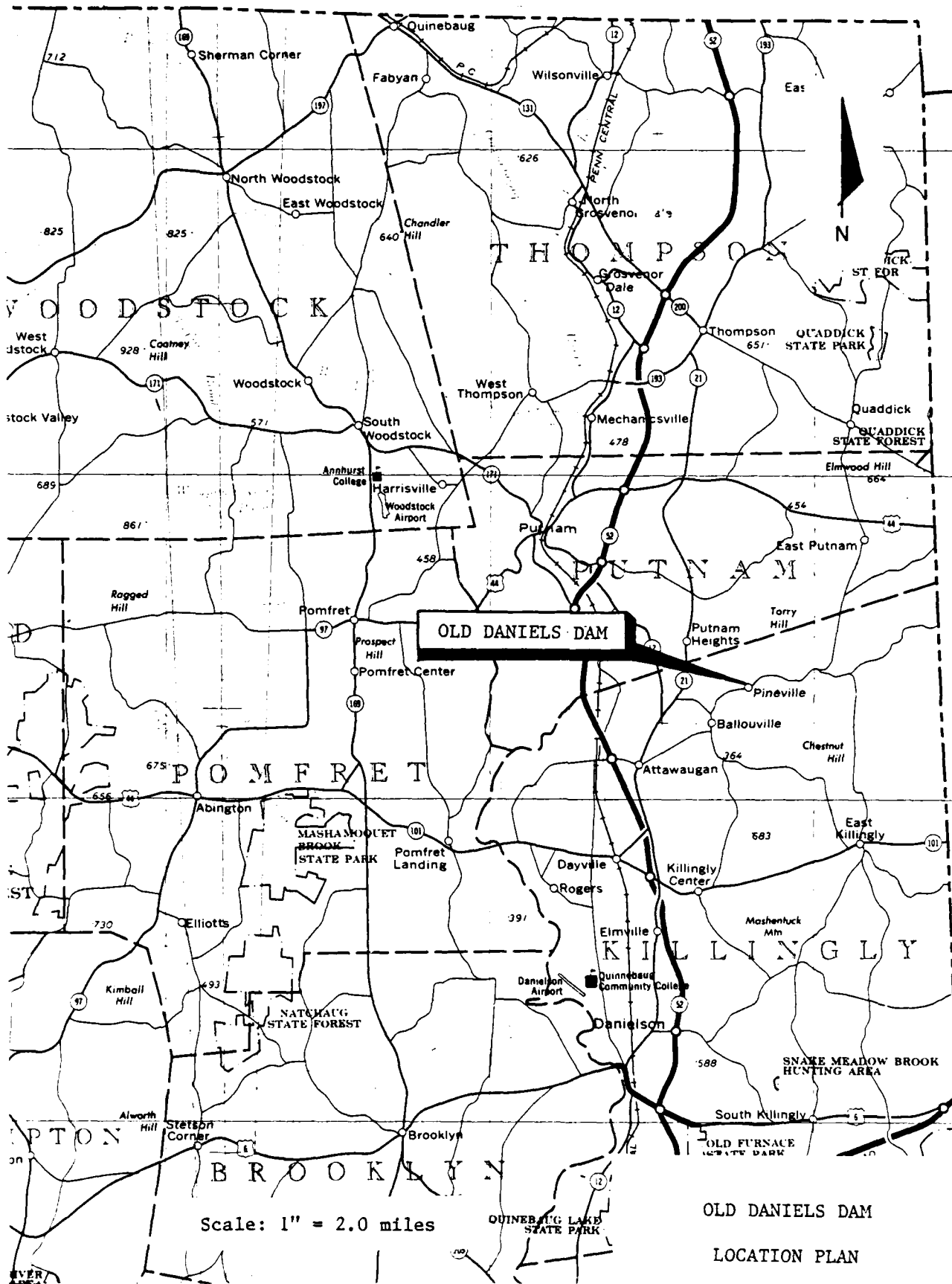
<u>Section</u>	<u>Page</u>
4.3 Evaluation	4-1
5. EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES	
5.1 General	5-1
5.2 Design Data	5-1
5.3 Experience Data	5-2
5.4 Test Flood Analysis	5-2
5.5 Dam Failure Analysis	5-2
6. EVALUATION OF STRUCTURAL STABILITY	
6.1 Visual Observations	6-1
6.2 Design & Construction Data	6-1
6.3 Post-Construction Changes	6-1
6.4 Seismic Stability	6-1
7. ASSESSMENT RECOMMENDATION & REMEDIAL MEASURES	
7.1 Dam Assessment	7-1
a. Condition	7-1
b. Adequacy of Information	7-1
c. Urgency	7-1
7.2 Recommendations	7-1
7.3 Remedial Measures	7-2
a. Operation & Maintenance Procedures	7-2
7.4 Alternatives	7-2

APPENDICES

APPENDIX A	INSPECTION CHECKLIST
APPENDIX B	ENGINEERING DATA
APPENDIX C	PHOTOGRAPHS
APPENDIX D	HYDROLOGIC & HYDRAULIC COMPUTATIONS
APPENDIX E	INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS



OVERVIEW PHOTO - Old Daniels Dam





NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

OLD DANIELS DAM

SECTION 1

PROJECT INFORMATION

1.1 General

- a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. CE Maguire, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to CE Maguire, Inc., under a letter from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-80-C-0013 has been assigned by the Corps of Engineers for this work.
- b. Purpose of Inspection.
  1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
  2. Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
  3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

- a. Location. Old Daniels Dam is located in the Town of Killingly, Windham County, Connecticut, at the intersection of River Road and Putnam Road. Coordinates of the dam are approximately 41°51.9'N Latitude and 71°51.1'W Longitude. The dam impounds water from Five Mile River which drains a 51.2 square mile watershed of rolling terrain. The axis of the dam is oriented in a northwest-southeast alignment with the impoundment to the north-east.

- b. Description of the Dam and Appurtenances. The dam is approximately 346 feet in length (including the overflow spillway), about 18 feet high, and is an earth embankment structure. The spillway is constructed of field stone masonry with a concrete capped weir section and is approximately 112 feet long. The spillway is located approximately 78 feet from the left dam abutment. The outlet works consists of a manually operated triple gated intake structure and concrete lined arch culvert headrace which presently discharges into Five Mile River approximately 155 feet downstream from the dam. The outlet works gate structure is located approximately 30 feet from the right spillway abutment.
- c. Size Classification.
- Old Daniels dam has an impoundment capacity at the top of the dam (elev. 361.0 feet N.G.V.D.) equal to 272 Ac-Ft. and a height of 18 feet. Guidelines established by the Corps of Engineers, indicate that both the height and storage for this dam classify it as a SMALL size structure.
- d. Hazard Classification.
- This dam is classified as a SIGNIFICANT hazard potential structure because its failure could result in loss of a few lives, inundation to 1-2 dwellings, 2 roads, one industrial structure, and may cause disruption to public utilities. Water depths at the inundated dwellings and industrial structure may range from 1 to 2 feet from the dam failure flow. It is estimated that the failure discharge of 6748 CFS will travel downstream through Five Mile River streambed with high velocities. Total water depths may range from 10-11 feet at a distance of 5,000 feet. See Appendix D for additional data.
- e. Ownership. Old Daniels Dam is owned by Sactchidananda Ashram - Yogaville, Inc., P. O. Box 108, Pomfret Center, Connecticut 06259.
- f. Operator. There are no operating personnel at the site. Any request for information should be through Brother Scretta at the above address or telephone 203/974-1045.
- g. Purpose of Dam. The impoundment at Old Daniels Dam is used for recreation.
- h. Design and Construction History. There are no records of construction for Old Daniels Dam. The dam was reportedly constructed about 1880. Repairs to the outlet works gates were completed in 1964. There are no other records of repairs available for the dam.

- i. Normal Operating Procedures. The water level is normally uncontrolled and allowed to discharge over the spillway crest. There are no operating procedures, therefore, for this dam.

### 1.3 Pertinent Data

a. Drainage Area.

The Old Daniels Dam drainage basin encompasses the northern reaches of the Five Mile River and extends into the following communities; Putnam, Killingly and Thompson, Connecticut; Glocester and Burrillville, Rhode Island; and Douglas, Massachusetts. The basin is generally rectangular in shape with a length of 8 miles, a width of 7 miles, and a total drainage area of 51.2 sq. miles) (See Appendix D for Basin Map). Approximately 10% of the watershed (5.12 sq. miles) is swampy or occupied by water storage reservoirs. The topography is generally flat with elevations ranging from a high of 610.0 feet NGVD to 358.0 feet at the spillway crest. Basin slopes being 0.01 to 0.015 feet per feet are generally flat. The time of concentration of the entire watershed is more than 3 hours and is relatively large, thus reducing the probability that all surface runoff will peak simultaneously at the reservoir site during a high intensity rainfall event. In addition, the large amount of storage areas within the watershed tend to moderately dampen and attenuate the peak flow.

- b. Discharges at Damsite. Limited discharge data is available for this dam. The estimated extreme freshet recorded in the files of Connecticut Department of Environmental Protection for this dam is equal to 1,460 CFS. Listed below are other discharge data for spillway and outlet works.

1. Outlet Works

Control Gates Size	Three 3.5' W x 4.0'H Invert elev. 350.4 feet (NGVD)
Outlet Conduit	7.3'W x 7.6'H concrete lined stone masonry arch.
i). Discharge capacity	490 CFS at spillway crest elev. 358.0
ii). Discharge capacity	600 CFS @ top of dam elev. 361.0
iii). Discharge capacity	700 CFS @ test flood elev. 364.53

- |                                       |  |   |
|---------------------------------------|--|---|
| 2.                                    | Maximum known flood at<br>damsite                        | 1460 CFS (March 1968)                             |
| 3.                                    | Ungated spillway capacity<br>at top of dam               | 1920 cfs  |
| 4.                                    | Ungated dam overflow capacity<br>at test flood elevation | 10,150 CFS  |
| 5.                                    | Gated spillway capacity at<br>normal pool elevation      | N/A   |
| 6.                                    | Gated spillway capacity at<br>test flood elevation       | N/A   |
| 7.                                    | Total spillway capacity at<br>test flood elevation       | N/A (Dam overtopped)                              |
| 8.                                    | Total project discharge at<br>top of dam                 | 2,520 CFS   |
| 9.                                    | Total project discharge at<br>test flood elevation       | 10,850  |
| c. <u>Elevations</u> (ft. above NGVD) |  |   |
| 1.                                    | Streambed at toe of dam                                  | Upstream not observ-<br>able.<br>Downstream 343.0 |
| 2.                                    | Bottom of cutoff   | Unknown   |
| 3.                                    | Maximum tailwater  | Unknown   |
| 4.                                    | Recreation pool  | 358.0   |
| 5.                                    | Full flood control pool                                  | Not applicable                                    |
| 6.                                    | Spillway crest   | 358.00  |
| 7.                                    | Design surcharge<br>(Original Design)                    | Unknown   |
| 8.                                    | Top of dam   | 361.0   |
| 9.                                    | Test flood surcharge                                     | 364.53  |
| d. <u>Reservoir</u> (Length in feet)  |  |   |

	1.	Normal pool	4,000		
	2.	Flood control pool	N/A		
	3.	Spillway crest pool	4,000		
	4.	Top of dam	4,000		
	5.	Test flood pool	4,000		
e.		<u>Storage (acre-feet)</u>			
	1.	Normal pool	176		
	2.	Flood control pool	N/A		
	3.	Spillway crest pool	176		
	4.	Top of dam	272		
	5.	Test flood pool	390		
f.		<u>Reservoir Surface (acres)</u>			
	1.	Normal pool	32		
	2.	Flood-control pool	N/A		
	3.	Spillway crest	32		
	4.	Test flood pool	32		
	5.	Top of dam	32		
g.		<u>Dam</u>			
	1.	Type	Earth embankment		
	2.	Length (including spillway)	346.0 feet		
	3.	Height	18 feet		
	4.	Top Width	Variable		
	5.	Side Slopes	Variable		
	6.	Zoning	Unknown		

7.	Impervious Core	Unknown
8.	Cutoff	Unknown
9.	Grout Curtain	Unknown
10.	Other	Unknown
h.	<u>Diversion and Regulating Tunnel</u>	N/A
i.	<u>Spillway</u>	
1.	Type	Concrete & stone masonry uncontrolled vertical overflow
2.	Length of weir	112 feet
3.	Crest elevation	358.0 feet
4.	Gates	None
5.	U/S Channel	Straight approach natural stream bed
6.	D/S Channel	Natural stream bed
7.	General	Immediately downstream stone masonry bridge abutments (Putnam Road Bridge) 32 feet wide x 17 feet high are quite restrictive to river flows.
j.	<u>Regulating Outlets</u>	
	Refer to paragraph 1.2b "Description of Dam and Appurtenances, Pg. 1-2 for description of outlet works	
1.	Invert	349.6 D.S. 350.4 U.S.
2.	Size	7.3 feet wide x 7.6 feet high concrete lined arch culvert with three -3.5'W x 4.0'H gates

3. Description

Gated stone masonry  
concrete lined arch  
culvert

4. Control Mechanism

Three manually operated  
3.5 W x 4 H feet wooden  
gates

5. Other

---

SECTION 2  
ENGINEERING DATA

2.1 Design Data

No design data is available for this dam.

2.2 Construction Data

No record of original construction is available for this dam. Some correspondence pertaining to minor repair work for the gates and appurtenances since July 1963, 1964, and 1966 is available and has been included in Appendix B.

2.3 Operation Data

No records are maintained of gate operation.

2.4 Evaluation of Data

- a. Availability. There are no plans, specifications, or computations available from the Owner regarding the design of this dam. Limited correspondence pertaining to repair work and field inspections were available from the State of Connecticut, Department of Environmental Protection.
- b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance, and sound engineering judgment.
- c. Validity. The validity of the limited data must be verified.



SECTION 3  
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase 1 Inspection of Old Daniels Dam was performed 2 April 1980 by representatives of CE Maguire, Inc. and Geotechnical Engineering, Inc.

Based on the visual inspection, history, and general appearance, the Old Daniels Dam and its appurtenances are judged to be in FAIR condition.

- b. Dam. The dam is an earth embankment structure with an overflow spillway located toward the left dam abutment. The total length of the dam including the 112-foot spillway is 346 feet.

The dam is divided into three sections by the spillway and gated headrace (see Plate B-1).

The upstream slope to the left of the spillway is covered with brush and trees of up to 14 inches in diameter. It appears that, at one point in time, the upstream face of the embankment slope was protected by a vertical stone masonry wall. A portion of this wall can be seen in Photo C-3 and, as shown in the photo, the wall is leaning slightly toward the Reservoir. Other remains of the wall can be seen along the upstream waters edge. The upstream slope is very irregular and in some locations sloughing has produced a nearly vertical face.

The upstream slope which is located between the right spillway abutment and the right headrace abutment is grass covered and faced with a vertical stone masonry wall. There are many dislodged stones, but generally this section is in fair condition.

The section of the upstream slope to the right of the headrace is grass covered and very irregular. Several trees and some light brush cover a small area of the embankment. Portions of the slope are faced with the remains of a stone masonry wall. The face of the wall appeared to be very irregular beneath the water surface and is partially collapsed at several locations where wave action has eroded the exposed slope.

The embankment crest to the left of the spillway is grass covered with a typical crest width of 14 feet. Trespassing has removed the grass cover in some areas (see Photo C-1). Runoff from the crest has caused some soil to wash out from behind the stone masonry wall on the upstream slope (see Photo C-3).

The crest of the dam embankment to the right of the spillway structure is grass covered and very wide. Several large diameter trees are growing on the crest. Elevations on this side of the crest vary approximately 1.5 feet lower than the crest elevations to the left of the spillway.

The downstream slope at the left of the spillway is very irregular and is covered with heavy brush and trees up to 20 inches in diameter (see Photo C-1).

The downstream slope at the right of the spillway is down to the watershed uneven and grass covered with some growth of thick brush and trees down to the waterline. Seepage was not noticed on the embankment slope. Water overflowing the spillway made it impossible to examine the right training wall for seepage.

c. Appurtenant Structures.

1. Spillway and Training Walls. The natural stream channel forming the approach channel to the spillway was submerged and could not be inspected during the field investigation of the dam.

The left downstream training wall of the spillway exhibited local bulging and tipping near the toe of the spillway. Several stones have been dislodged and soil from behind the wall has eroded to produce local depressions. (See Photo C-12).

2. Outlet Works. The outlet works consists of a headrace with a manually operated triple gated 7.5-foot diameter concrete lined stone masonry arch culvert located approximately 30 feet from the right spillway abutment. The timber control gates are approximately 3.5 W x 4 H feet each and were reportedly rehabilitated in 1964. Some leakage of the gates was noted during the field inspection of the dam (see Photo C-10 taken from within the arch culvert). The arch culvert is approximately 155 feet in length. Discharges through the culvert flow some over foundation ruins and finally into Five Mile River approximately 250 feet from the toe of the spillway.

The concrete lined arch conduit once served as a source of power for a mill located some distance downstream. The original length of the conduit was apparently about 372 feet. The outlet conduit, now however, has been shortened by the construction of a masonry bulkhead. Flows now discharge at a point approximately 155 feet below the dam, through the sidewall of the culvert tunnel.

The overall appearance of the conduit (see Photo C-9) is fair. Several areas along the joint between the sidewalks and floor slab of the conduit have been eroded from scour and water was observed to flow or seep out before reaching the outlet. Spalling and cracking of the concrete in the conduit and exposed reinforcement were observed. The left and right sidewalls of the intake structure also showed general deterioration (see Photo C-8). The exposed concrete on the gate structure appeared to be in good condition.

- d. Reservoir Area. No specific detrimental features in the reservoir area were observed during the visual inspection. The slopes of the shoreline are well covered with trees and brush to preclude sloughing of shoreline materials.
- e. Downstream Channel. The spillway discharge channel consists of the natural stream bed of the Five Mile River. The left and right banks of the channel immediately downstream from the toe of the spillway are stone walls which extend downstream to the Putnam Road Bridge, approximately 76 feet from the spillway crest (see Photo C-7). The approximate dimensions of the bridge opening are 32 feet wide (bridge abutment to bridge abutment) by 17 feet high (stream bed to the low cord of the bridge). There is a small island of large trees and brush located at the toe of the spillway. Numerous trees overhang the discharge channel downstream of the Putnam Road Bridge. The superstructure of the bridge was eroded and in disrepair.

### 3.2 Evaluation

Based on visual observation, the dam is judged to be in fair condition with several areas which require attention:

- a. Lack of slope protection on the upstream slopes left and right of the spillway could lead to erosion of the upstream slopes and crest of the embankment.
- b. Trees on the upstream and downstream slopes could be uprooted during storms, leaving depressions that may encourage further erosion of the slopes. Continued growth of tree roots could provide paths of seepage through the embankment.
- c. Trees growing adjacent to the top of the downstream spillway channel walls could dislodge or displace stones in that wall as the root development increases.
- d. Continued collapse of the left downstream channel wall could reduce the stability of the downstream slope of the embankment left of the spillway and encourage sloughing into the downstream channel.

- e. A detailed examination of the spillway should be made during a low flood period.

## SECTION 4

### OPERATIONAL & MAINTENANCE PROCEDURES

#### 4.1 Operational Procedures

- a. General. The water level at Old Daniels Dam is generally uncontrolled. All discharges pass over the uncontrolled spillway with the outlet works gates closed. As a rule, the outlet gates are opened only for repair work.
- b. Description of Any Warning System in Effect. No warning system is in effect for this dam.

#### 4.2 Maintenance Procedures

- a. General. There is no specific maintenance program for this dam.
- b. Operating Facilities. The operating gates of the outlet works were reportedly rehabilitated in 1964. There is no scheduled maintenance program for Old Daniels Dam, but rather maintenance is generally undertaken on an as-needed basis.

#### 4.3 Evaluation

There is no regularly scheduled maintenance program. A systematic and complete inspection and maintenance program should be developed and instituted at the dam. An Emergency Action Plan also needs to be developed and implemented that will provide the Owner with adequate time to respond to critical situations.

## SECTION 5

### EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

#### 5.1 General.

The Old Daniels Dam is located on Five Mile River at the intersection of Putnam Road and River Road, in the Town of Killingly, Connecticut. The watershed for the reservoir is equal to 51.2 square miles with approximately 10 percent of this basin natural storages and swamp. There is a gaging station located downstream from the dam approximately 3 miles.

The dam has a spillway length of 112 feet and a surcharge height of 3.0 feet. The total length of the dam is 346 feet. The reservoir has a storage capacity at the spillway crest level of 176 Ac-Ft. and can accommodate 0.64 inches of runoff from the watershed. Each foot of depth in the reservoir above the spillway level can accommodate 32 Ac-Ft. of volume of water equivalent to 0.12 inches of runoff.

Because the dam has only 96 Ac-Ft. of surcharge storage available, it is considered a small storage facility. With a maximum spillway capacity equal to 1,920 CFS, which is 19 percent of the "test flood" outflow, the dam is a low spillage facility. Since the embankments are earth, it is considered less stable against overtopping and erosion.

#### 5.2 Design Data.

No specific design data is available for this watershed or structure at Old Daniels Dam. In lieu of existing design information, U.S.G.S. Topographic Maps (Scale 1" = 2,000') were utilized to develop hydrologic parameters such as drainage areas, reservoir surface areas, basin slopes, time of concentration, and other runoff characteristics. Elevation/storage relationships for the reservoir were approximated. Surcharge storage was computed assuming that the surface area remained constant above the spillway crest. Some of the pertinent hydraulic data was obtained and/or confirmed by actual field measurements at the time of visual field inspection.

Test flood inflow/outflow values and dam failure profiles were determined in accordance with the Corps of Engineers guidelines. Final values in this report are approximate and are no substitute for actual detailed analysis.

### 5.3 Experience Data.

No historical data for recorded discharges or water surface elevations are available for this dam or the watershed. Gage data for the U.S.G.S. gaging station located approximately 3.0 miles downstream of the dam can be obtained from U.S.G.S. Connecticut, telephone 203/244/2528. The U.S. Geologic Survey list for gauge # 01126000 Five Mile River at Killingly, Connecticut, the maximum discharge for the period of record 1938-1979 is 2480 CFS occurring July 24, 1938.

### 5.4 Test Flood Analysis.

Recommended guidelines for Safety Inspection of Dams by the Corps of Engineers were used for selection of the "Test Flood". This dam is classified under those guidelines as a SIGNIFICANT hazard and SMALL in size. Guidelines indicate that a 100-year to half PMF storm event be used as a range of test floods for such classification. The watershed has a total drainage area equal to 51.2 square miles of which 5.12 (10 percent) is swampy or covered by natural storages. This drainage area is sparsely populated, mostly wooded, and generally flat with rolling terrain. Basin slopes average 0.02 feet/feet and are considered flat. The watershed was classified as coastal flat. A test flood equal to one-half the PMF was calculated to be 200 CSM, equal to 10,240 CFS for a drainage area of 51.2 square miles. The outflow discharge for the test flood inflow was 10,150 CFS. The spillway and outlet rating curves are illustrated in Appendix D. Flood routings were performed with the assumed initial condition of full reservoir (at spillway crest elevation).

The analysis indicates that the spillway capacity is hydraulically inadequate to pass the test flood. The routed test flood would overtop the dam by approximately 3.53 feet assuming the overflow length of dam was 234 feet. The inflow and outflow discharge values for this test flood are 10,240 CFS and 10,150 CFS, respectively. The maximum outflow capacity of the spillway without overtopping the dam is 1,920 CFS which is only 19 percent of the test flood outflow.

At the spillway crest elevation of 358.0 feet, the capacity of the outlet structure is 490 CFS. It will require one hour to lower the reservoir level the first foot assuming a pool surface area of 32 acres. For the total 196 Ac-Ft. of available storage below the spillway crest, it will require one half day to drain this reservoir.

### 5.5 Dam Failure Analysis

For this analysis, a full depth - partial width (41.0 feet) breach was assumed to have occurred in this dam. This will result in an unsteady flow condition that produces a flood wave that travels

downstream through the valley as well as a reflective wave that rebounds in the reservoir and reinforces the downstream surge.

The calculated dam failure discharge of 6,798 CFS assumes the reservoir is full at the top of dam just prior to failure, and will produce an approximate water surface level of elevation 351.5 immediately downstream from the dam. This will raise the water surface approximately 6.0 feet over the depth just prior to failure when the discharge is 1,920 CFS. The estimated damage reach extends downstream 5,000 feet where normal uniform flow would occur. The failure could result in the loss of a few lives, inundation of 1-2 dwellings and one industrial building, potential damage to 2 roads (Putnam Road and River Road), and disruption of public utilities within the rights of way of the roadways. Water depths from the dam failure flow at the inundated structures will range from 1 to 2 feet.

It is estimated that total water depths would average 10.8 feet and that velocities of flow could cause erosion, stripping of vegetation, and additional damage from debris impact. The prime impact area has been estimated, if the dam were to fail, and has been delineated on a U.S.G.S. quadrangle map in Appendix D. As a result of the failure analysis, the dam has been classified as a SIGNIFICANT hazard structure.



# OLD DANIELS DAM

## Inflow, Outflow and Surge Data

FREQUENCY IN YEARS	24-HOUR TOTAL RAINFALL IN INCHES	24-HOUR* EFFECTIVE RAINFALL IN INCHES	MAXIMUM INFLOW IN C.F.S.	MAXIMUM** OUTFLOW IN C.F.S.	SURCHARGE HEIGHT IN FEET	SURCHARGE STORAGE ELEVATION
100	7.0	4.6	3584	3400	3.90	361.90
$\frac{1}{2}$ PMF = Test Flood	11.9	9.5	10240	10150	6.53	364.53

\*Infiltration assumed as 0.1"/hour

\*\*Lake assumed initially full at spillway crest elevation 358.0  
(top of dam = 361.0)

### NOTES:

1.  $Q_{100}$ ; inflow discharges were computed by the approximate methodology of the Soil Conservation Service.
2.  $\frac{1}{2}$  PMF and "test flood" computation based on COE instructions and guidelines.
3. Maximum capacity of spillway without overtopping the top of the dam elevation (361.0) is equal to 1,920 C.F.S.
4. All discharges indicated are dependent upon the continued integrity of upstream storage reservoirs.
5. Surge storage is allowed to overtop the dam when exceeding the spillway capacity.
6. Test flood = Half PMF = 200 CSM = 10,240 CFS  
(D.A. = 51.2 square miles).

## SECTION 6

### EVALUATION OF STRUCTURAL STABILITY

#### 6.1 Visual Observations

The visual observations did not disclose any evidence of present structural instability except for the local collapse of a portion of the stone wall that forms the downstream left training wall of the spillway. Conditions observed that may lead to future structural instability include:

1. Continued erosion of the upstream slopes of the earth embankments due to lack of slope protection.
2. Presence of trees on the slopes of the earth embankments and spillway training walls that by uprooting during storms or by continued root development cause the failure of the structure.

#### 6.2 Design and Construction Data

No design or construction drawings or records for the embankment or spillway are available.

#### 6.3 Post-Construction Changes

Repair to the wooden low-level gates are indicated to have been completed in an inspection report dated September 4, 1964.

#### 6.4 Seismic Stability

The dam is located in Seismic Zone 1, and in accordance with the Recommended Phase 1 Guidelines does not warrant seismic stability analysis.

## SECTION 7

### ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

#### 7.1 Assessment

- a. Condition. Based on the visual inspection, the dam appears to be in FAIR condition. There are several features that could adversely affect the condition of the dam in the future:
  1. Lack of riprap protection on the upstream slopes.
  2. Trees on the embankment slopes and adjacent to the stone training walls of the spillway discharge channel could dislodge stones or cause the collapse of the walls from further root development or uprooting during storm activity.
  3. The partly collapsed stone wall on the left bank of the spillway discharge channel which could increase sloughing and further collapse of the wall, especially during high water.
- b. Adequacy of Information. The available information is such that the assessment of the condition of the dam must be based on visual observation only.
- c. Urgency. The recommendations and remedial measures described below should be implemented by the Owner within one year after receipt of the Phase 1 report.

#### 7.2 Recommendations

The following items should be undertaken under the direction of a qualified registered engineer and recommendations resulting from any analyses should be implemented by the Owner.

- a. Design and place riprap on upstream slopes of the embankment.
- b. Remove trees growing on the embankment slopes and backfill root depressions with appropriate compacted soils.
- c. Cut all trees growing within 20 feet of the stone walls forming the sidewalls of the spillway discharge channel from the spillway to the Putnam Road Bridge.
- d. Repair all sections of the stone sidewalls forming the banks of the spillway discharge channel where large voids or irregularities exist and where the walls are partly collapsed.

- e. Inspect the spillway when there is minimum or no flow.
- f. Perform detailed hydrologic and hydraulic investigations to further assess the need for and means to increase the project discharge capacity.

### 7.3 Remedial Measures

#### a. Operation and Maintenance Procedures.

1. Clear brush, vines and trees on the downstream and upstream slopes.
2. Institute a program of annual technical inspection by a qualified registered engineer.
3. Develop a system for the recording of data with regard to items such as water levels, discharges, time and drawdown to assist those responsible for the monitoring of the structure.

### 7.4 Alternates

There are no recommended alternates to the recommendations discussed above.

APPENDIX A  
INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST  
PARTY ORGANIZATION

PROJECT Old Daniels Dam DATE April 2, 1980  
TIME 9:00 A.M.  
WEATHER Cloudy 40°F  
W.S.ELEV. 358.85 U.S. 343.5 D.S.

PARTY :

1. <u>A. Reed, CEM</u>	6. <u>R. Stetkar, GEI</u>
2. <u>L. Topp, CEM</u>	7. _____
3. <u>R. Brown, CEM</u>	8. _____
4. <u>E. Dessert, CEM</u>	9. _____
5. <u>G. Castro, GEI</u>	10. _____

PROJECT FEATURE	INSPECTED BY	REMARKS
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____

# PERIODIC INSPECTION CHECKLIST

PROJECT Old Daniels Dam DATE April 2, 1980

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	358.0
Current Pool Elevation	358.85
Maximum Impoundment to Date	Unknown. March 18 & 19, 1968 - 2½ feet of water over spillway (5 inches free-board).
Surface Cracks	None observed.
Movement or Settlement of Crest	Too irregular to judge.
Lateral Movement	Too irregular to judge.
Vertical Alignment	Too irregular to judge.
Horizontal Alignment	Too irregular to judge.
Condition at Abutment and at Concrete Structures	Some erosion behind left training wall of spillway.
Trespassing on Slopes	Some on crest of left embankment - more observed on right embankment.
Sloughing or Erosion of Slopes or Abutments	Erosion at water level on upstream slope of left embankment. No significant erosion on right embankment.
Rock Slope Protection - Riprap Failures	No slope protection.
Unusual Movement or Cracking at or Near Toe.	None observed.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.

# PERIODIC INSPECTION CHECKLIST

PROJECT Old Daniels Dam DATE April 2, 1980

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u> (Cont.)	
Foundation Drainage Features	None observed
Toe Drains	None observed.
Instrumentation System	None observed.



# PERIODIC INSPECTION CHECKLIST

PROJECT Old Daniels Dam DATE April 2, 1980

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	
Slope Conditions	Flat, natural bed of Five Mile River.
Bottom Conditions	Earth
Rock Slides or Falls	None observed.
Log Boom	None
Debris	None
Condition of Concrete Lining	None
Drains or Weep Holes	None
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	Gates rehabilitated in 1964 appear in good condition ; some leakage at seats.

# PERIODIC INSPECTION CHECKLIST

PROJECT Old Daniels Dam DATE April 2, 1980  
 INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_  
 INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONDUIT</u>	Conduit 7.5'H x 7.25'W concrete arch, flat invert. Concrete stone masonry faced with concrete.
General Condition of Concrete	Fair
Rust or Staining on Concrete	None observed.
Spalling	Yes, near invert at sidewalls.
Erosion or Cavitation	None observed.
Cracking	None observed.
Alignment of Monoliths	Good alignment.
Alignment of Joints	Good alignment,

# PERIODIC INSPECTION CHECKLIST

PROJECT Old Daniels Dam DATE April 2, 1980

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	Poor
Rust or Staining	None observed
Spalling	Base slab - right training wall eroded.
Erosion or Cavitation	None
Visible Reinforcing	Yes, through crown where holes were opened.
Any Seepage or Efflorescence	Flow in arch from gates not observable.
Condition at Joints	Good
Drain Holes	None
Channel	Natural streambed of Five Mile River.
Loose Rock or Trees Overhanging Channel	Numerous
Condition of Discharge Channel	Overgrown with vegetation and loose stone.

# PERIODIC INSPECTION CHECKLIST

PROJECT Old Daniels Dam DATE April 2, 1980  
 INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_  
 INSPECTOR \_\_\_\_\_ DISCIPLINE \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	Spillway crest length 112 ft.
a. Approach Channel	Natural bed of Five Mile River, Straight.
General Condition	Good
Loose Rock Overhanging Channel	None observed,
Trees Overhanging Channel	Many along streambank of river.
Floor of Approach Channel	Earth
b. Weir and Training Walls	Right abutment 3.5'H Left abutment 2.4'H
General Condition of Masonry	Dislodged, portion tilted into river.
Rust or Staining	None
Spalling	Facing of ogee partially spalled.
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None observed. Flow over weir.
Drain Holes	None
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Many
Floor of Channel	Natural streambed.
Other Obstructions	Putnam Road Bridge opening 77 ft. downstream. Opening 32'W x 17'H. Large trees growing at downstream toe of spillway.

APPENDIX B  
ENGINEERING DATA

APPENDIX B-1

Correspondence pertaining to the history,  
maintenance, and modifications to the  
Old Daniels Dam as well as copies of  
past inspection reports are located at:

State of Connecticut  
Department of Environmental Protection  
*State Office Building*  
165 Capitol Avenue  
Hartford, Connecticut  
Attention: Mr. Victor J. Galgowski,  
Dam Safety Engineer

APPENDIX B-2

SELECTED COPIES OF PAST INSPECTION REPORTS

## Interdepartment Message

STO-201 REV. 3/77 STATE OF CONNECTICUT  
Stock No. 6938-051-011

SAVE TIME: Handwritten messages are acceptable.

Use carbon if you really need a copy. If typewritten, ignore faint lines.

<b>To</b>	NAME	Victor F. Galgowski	TITLE	Supt. of Dam Maintenance	DATE	23 May 1978
	AGENCY	Water Resources Unit	ADDRESS			
<b>From</b>	NAME	Charles J. Pelletier	TITLE	Consultant	TELEPHONE	
	AGENCY	Environmental Protection	ADDRESS			
SUBJECT Old Daniels Dam, Killingly 5						

This dam was inspected on May 19, 1978. The estimated flow at the time of inspection was about 200 c.f.s. The spillway is masonry with a concrete cap and is about 120' long. The training walls at the ends of the spillway are about 3.7 feet above the spillway crest. This spillway has an estimated capacity of about 2250 c.f.s. with no freeboard or about 1255 c.f.s. with one foot of freeboard. Referring to Part 1 of the Water Resources Inventory of Connecticut, the 100 year or 5 x mean annual flood, on this stream (Five Mile River) is about 3000 c.f.s. at the gage where the drainage area is 58.2 square miles. Drainage area at this dam is 51.2 square miles. The spillway capacity (no freeboard) is less than Q 100.

There is a short earth embankment at the south end of the spillway and a larger section north from the spillway. There are two low areas in the northerly embankment - both about 3.1 feet above the spillway. The estimated Q 100 = 2700 c.f.s. would overtop the dam in these areas by about 0.5 feet. One of these overflows is to the north and then west along the adjacent town road. The other is west across the dam where the dam section has a broad flat top. It is unlikely that overflows would cause a substantial failure of this dam.

There is a forebay and gate structure in the northerly earth section which discharges through a concrete conduit. The conduit extends about 100 yards to the northwest. Water passing through the gate is being discharged through an opening in the side of the conduit on the west side of Putnam Road. A small building is located on the end of the conduit and some part of the conduit appears to have been converted for human occupancy.

The spillway is about 17 feet above the downstream channel. The masonry in the spillway could not be observed because of the flow. The masonry training walls at the ends of the spillway appear to be in satisfactory condition except for the section at the south end of the spillway opposite the toe of the spillway. Masonry at this point is partially collapsed.


The gate structure appears to be in good condition, however, the concrete sides of the forebay are in poor condition.



The risk of failure of this dam with sudden release of a large volume of water is low. However, it would be desirable to do some work and make some changes to improve the structure.

1. The most important work to be done is the restoration of the training wall at the south end of the dam.
2. Trees on and adjacent to the southerly earth embankment should be removed to ground level.
3. The earth embankment should be raised to eliminate the low points and provide a one foot freeboard above the 100 year flood. The embankment south from the spillway should be widened at the same time.
4. Concrete in the area of the forebay should be repaired.

The spillway masonry should be inspected at low flow conditions.

  
Water Resources Unit

CJP:ljc

## INTERDEPARTMENT MAIL

DATE

April 1, 1968

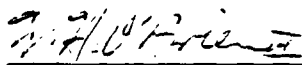
TO	<i>File</i>	DEPARTMENT	
BY	William H. O'Brien	DEPARTMENT	Water Resources Commission
SUBJECT	Old Daniels Dam, Killingly <i>(or Warsaw Dam)</i>		

On March 27, 1968, at the request of Owen Bell, Town Manager, the undersigned visited the subject dam with Mr. Bell and Irving Owen, Road Foreman.

There were some small trees growing on the east earth abutment and one 18 inch elm on the West side which should be cut down. The downstream face of the spillway has an excellent cover of concrete over what appears to be irregularly laid stones to create a splashing effect.

The storm of March 18th and 19th, 1968, created more run-off at this location than either the 1938 or 1955 storms according to Mr. Owen. In this March storm there was approximately 2½ feet of water going over the spillway with 5 inches of freeboard. Some stones in the retaining wall on the downstream east side had been <sup>dis</sup>replaced. They should be replaced and strengthened.

Mr. Bell is to send me the owner's name and address. We will then write to the owner, with our ~~comments~~ comments.



William H. O'Brien  
Civil Engineer

STATE WATER RESOURCES COMMISSION RECEIVED SEP 15 1966 ANSWERED _____ REFERRED _____ FILED _____
---

September 13, 1966

Re: Dam on Five Mile River

Mr. Thomas Young  
Aspinock Road  
Killingly, Connecticut

Dear Sir:-

At your request I made an inspection today of your dam on Five Mile River in Killingly, Connecticut.

This is located 41° 52' 59" North and 71° 51' 3" West on the Thompson Quadrangle of the U. S. Geological Survey.

On July 22, 1963 I made a report on the dam suggesting certain changes and improvements on the gates leading to the sluiceway. These changes were made and are satisfactory.

At the present time the concrete on the walls leading to the gates is in poor condition. This concrete should be removed and replaced with new good concrete with a mix of 1 part cement 2 parts sand and 3 parts gravel.

The stone work on the West abutment wall above the dam needs relaying and repointing. A small section of the top of the dam should have concrete placed on it to hold the stones in place. This is on the West end of dam.

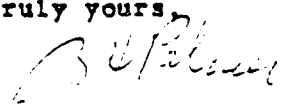
There is one leak on the East side of dam which shows up downstream. I suggest pulling the pond down 2 or 3 feet in depth and trying to seal off the East abutment wall with concrete. At that time an effort should be made to locate the leak and perhaps stop it with several loads of clay or light material.

I do not consider the dam to be in any danger and the above items should be considered as routine maintenance.

The spillway is 120 feet long and abutment on West side is 3 feet high and 4 feet high on West side. This dam is at least 70 years old and has withstood all floods and is in fairly good condition now.

The repair items suggested above are not critical but I think should be done as soon as convenient.

Very truly yours,



BHP/ew

c.c.: Mr. William P. Sander  
State Water Resources Commission

DATE

September 4, 1964

INTERDEPARTMENT MAIL

TO	DEPARTMENT
John J. Curry, Chief Engineer	Water Resources
FROM	DEPARTMENT
William P. Sander, Engineer - Geologist	Water Resources
SUBJECT	
Old Daniels Dam - Killingslv	

On September 1, 1964, an inspection was made of the recently completed repairs to the above mentioned dam. These repairs were ordered on March 2, 1964 with completion to be by September 2, 1964.

The repairs to the wood gates were found to be according to the approved plan and the entire job was well done.

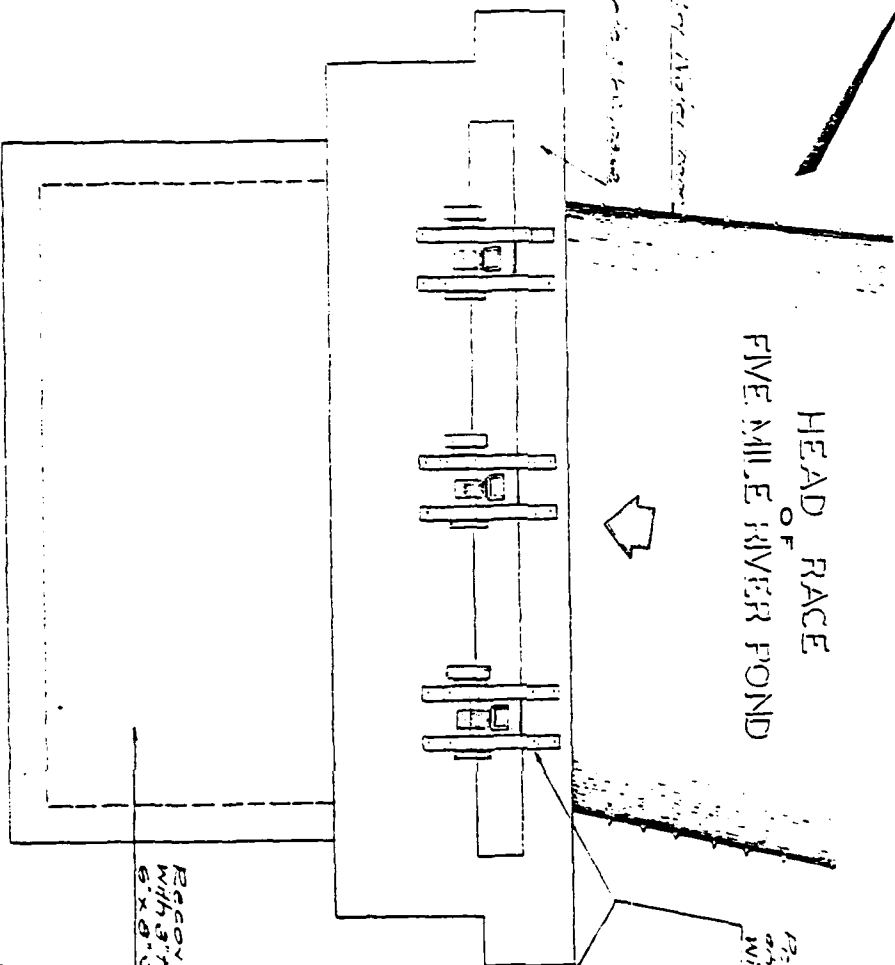
It is my recommendation that a certificate of approval now be issued for these repairs.

WPS  
Engineer - Geologist

WPS:js

*Give data to [unclear]  
E. Curry  
need to [unclear]  
[unclear]*

# HEAD RACE OF FIVE MILE RIVER POND



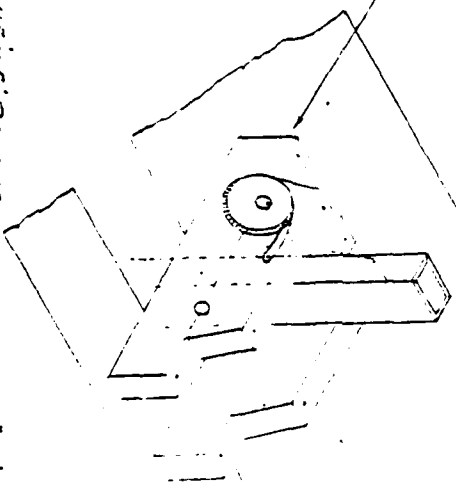
SCALE 1"=2'

MARCH 23, 1964

1300 lbs. 35 sections of timber  
around and around in my structure  
with 3" x 6" timbers

Recover 115 x 5' opening  
with 3" thick plank on  
6 x 8 stringers

SCALE 1"=1'



PLAN OF  
PROPOSED WORK  
ON  
SLUICE GATES  
OWNED BY  
THE STATE OF TEXAS  
DALLAS, TEXAS  
FEDERAL CONTRACT NO. 1

BENJAMIN H. PALMER  
SHEPARD S. PALMER

CHANDLER & PALMER  
CIVIL ENGINEERS

114-116 THAYER BUILDING  
TELEPHONE TURNER 7-5640

MEMBERS AMERICAN AND CONNECTICUT SOCIETIES  
OF CIVIL ENGINEERS

DAMS  
WATER SUPPLIES  
SEWERAGE  
APPRAISALS  
REPORTS  
SURVEYS

NORWICH, CONN.

July 22, 1963

State of Connecticut  
Water Resources Commission  
State Office Building  
Hartford 15, Connecticut

ATTENTION: Mr. William P. Sander

Dear Sir:

Referring to your letter of July 18, 1963, I have, today, inspected the dam which is located near Pineville. This is located at 41 degrees 52 minutes 59 seconds North and 71 degrees 51 minutes 03 seconds West on the Thompson Quadrangle.

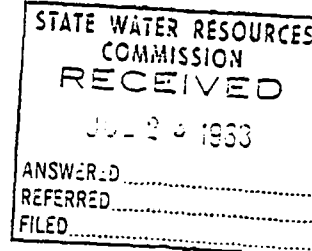
This dam is known locally as the Old Daniels Dam. It consists of an earth dam with stone step facing on the downstream side. The dam itself is in reasonably good condition although no maintenance work has been done on it for a long time.

On the Westerly side of the dam there are three wooden gates which lead to a concrete sluiceway. These wooden gates are badly rotted and are leaking water quite badly, although the gates are closed. The wooden timbers over the structure are rotted and broken and present a hazard for any persons who might fall into this area. A large six foot diameter concrete sluiceway takes the water under the road and discharges it into the brook downstream.

I consider that the wooden gates and cover over the entrance to the sluiceway present a definite hazard and should be repaired. If the gates fail, they will permit a large amount of water to go downstream very rapidly which might cause trouble downstream. I recommend that the Owner be required to either replace the gates and timber work or else open the gates gradually and release the water in the pond. The concrete work at the sluiceway entrance also needs some corrective work done to it.

I think that these items should be taken care of at once.

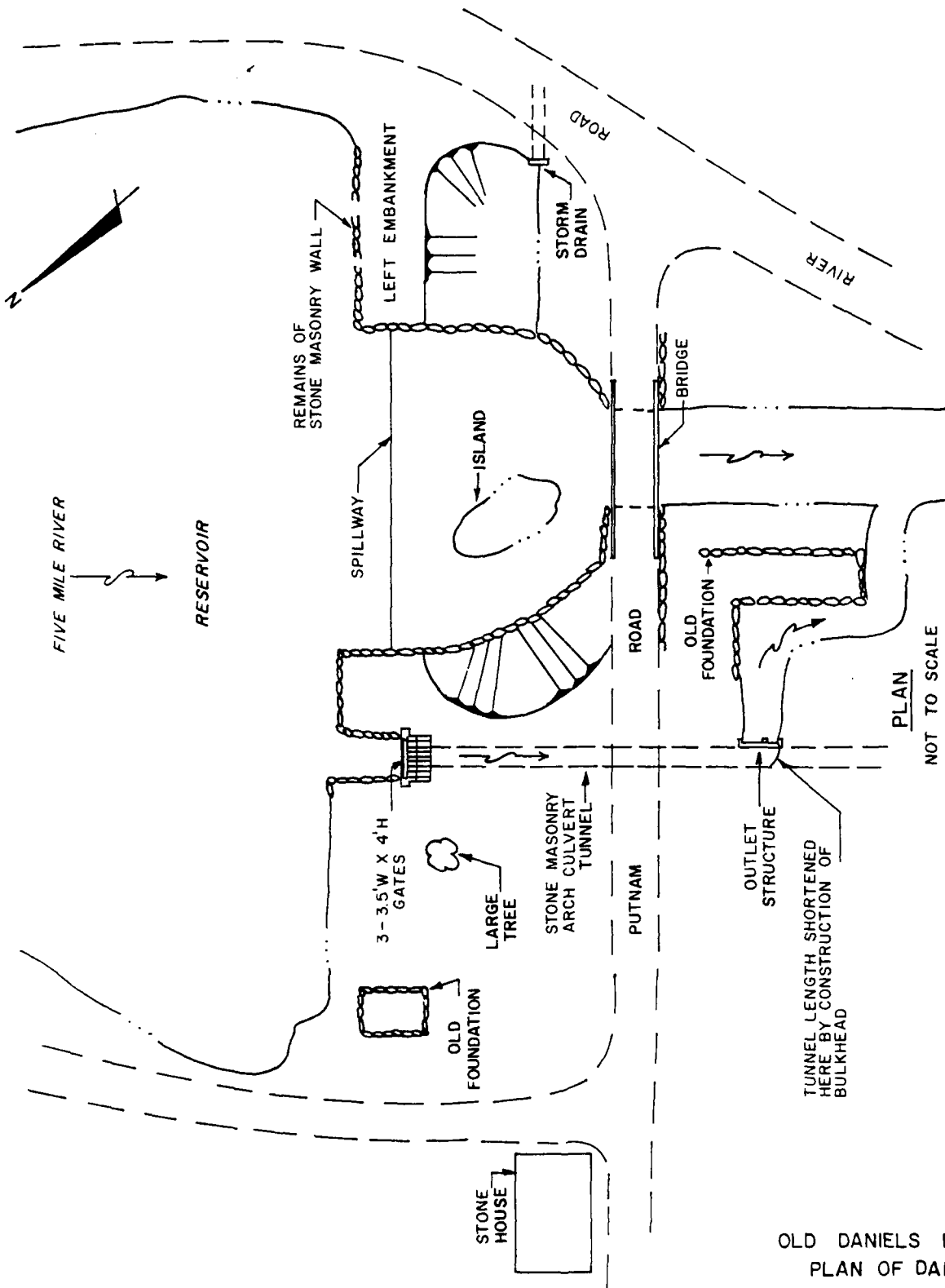
Very truly yours,  
CHANDLER & PALMER



*S. H. Palmer*

APPENDIX B-3

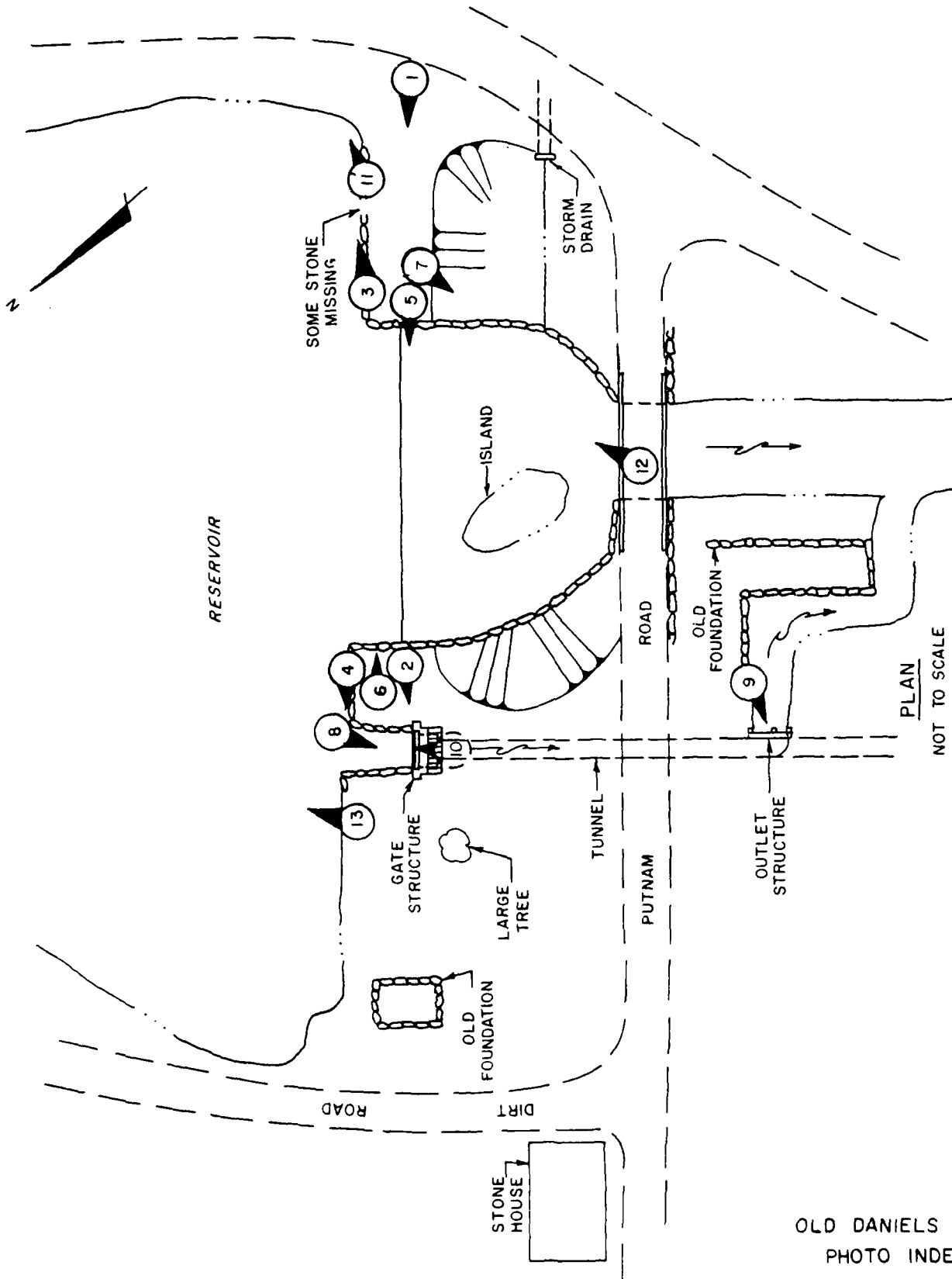
PLANS, SECTIONS AND DETAILS



OLD DANIELS DAM  
PLAN OF DAM



APPENDIX C  
PHOTOGRAPHS



OLD DANIELS DAM  
PHOTO INDEX



PHOTO C-1 Crest of dam and downstream slope looking from the left dam abutment. Note large trees growing on the slope.



PHOTO C-2 Crest of dam looking from the right spillway abutment.



PHOTO C-3 Upstream slope looking from the left spillway abutment toward the left dam abutment. Note large trees and brush growing on slope and stone masonry wall tilting toward the reservoir.



PHOTO C-4 Upstream slope of dam and headrace looking toward the right dam abutment from the right spillway abutment.



PHOTO C-5 Spillway crest looking from the left spillway abutment.

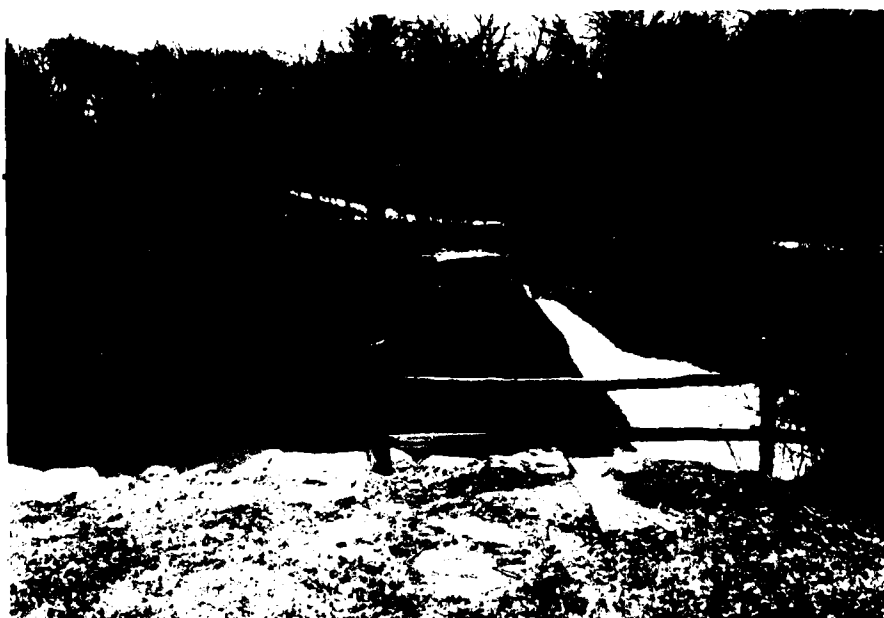


PHOTO C-6 Spillway crest looking from the right spillway abutment.



PHOTO C-7 Spillway discharge channel looking from the left spillway abutment. Note small island with brush and trees right center and narrow bridge opening in background.

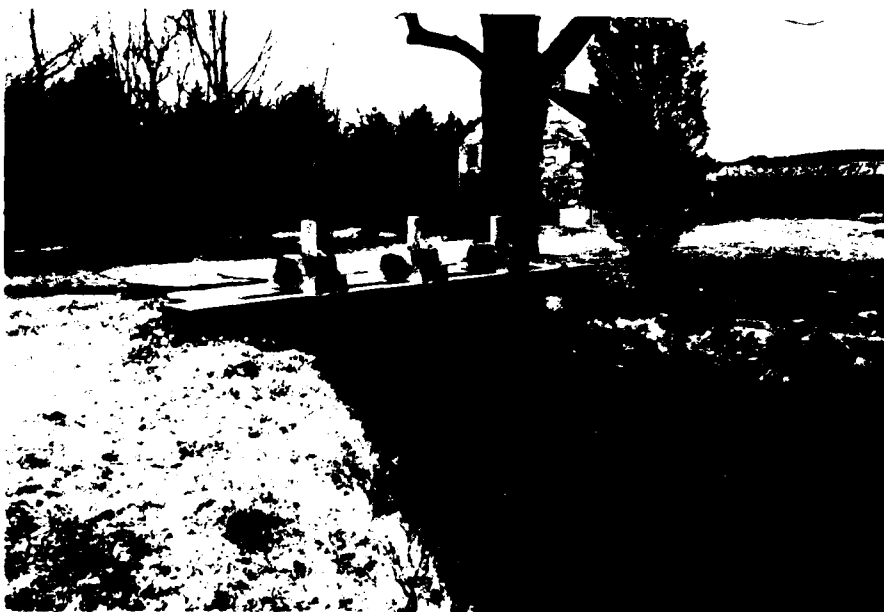


PHOTO C-8 Triple gated headrace.

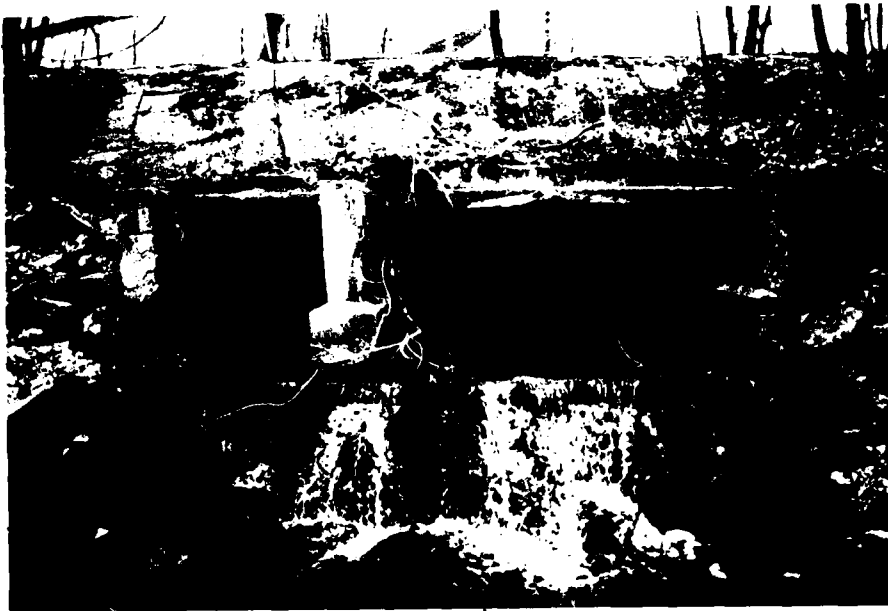


PHOTO C-9 Tailrace outlet chamber.



PHOTO C-10 Downstream side of the triple gated headrace intake chamber taken from inside the outlet conduit looking at gates. Note water leaking between wooden gates and concrete seats.



PHOTO C-11 Large diameter trees growing on upstream embankment and erosion of embankment taken near left spillway abutment looking in the direction of the left dam abutment.

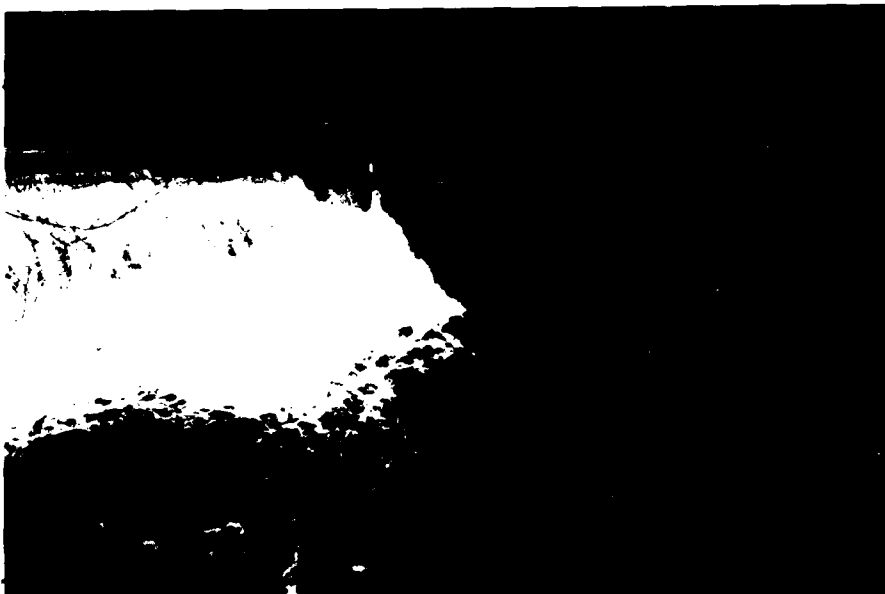


PHOTO C-12 Left spillway discharge channel wall. Note dislodged stones at center of photo.

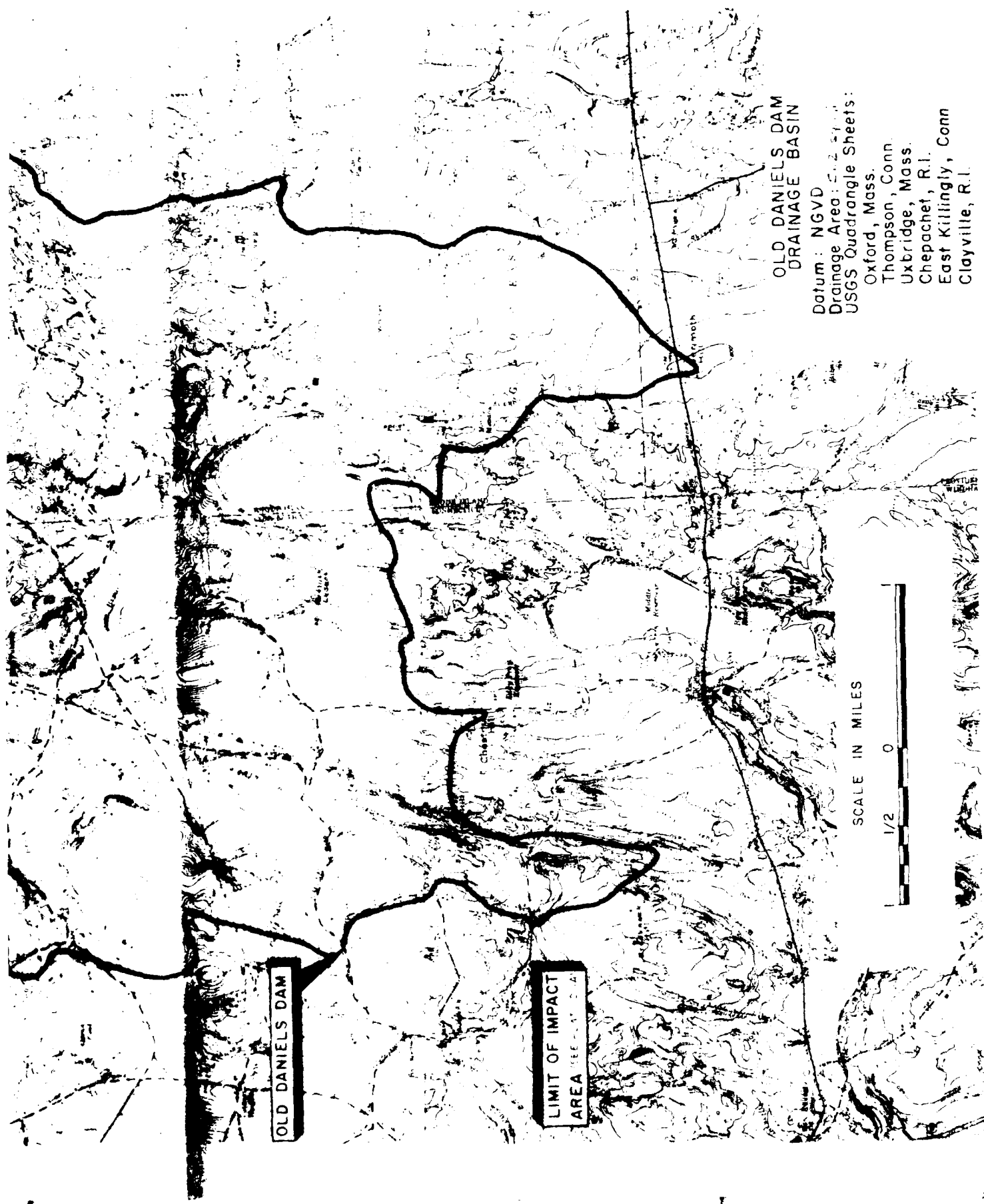




PHOTO C-13 Overview photo of pond.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



OLD DANIELS DAM

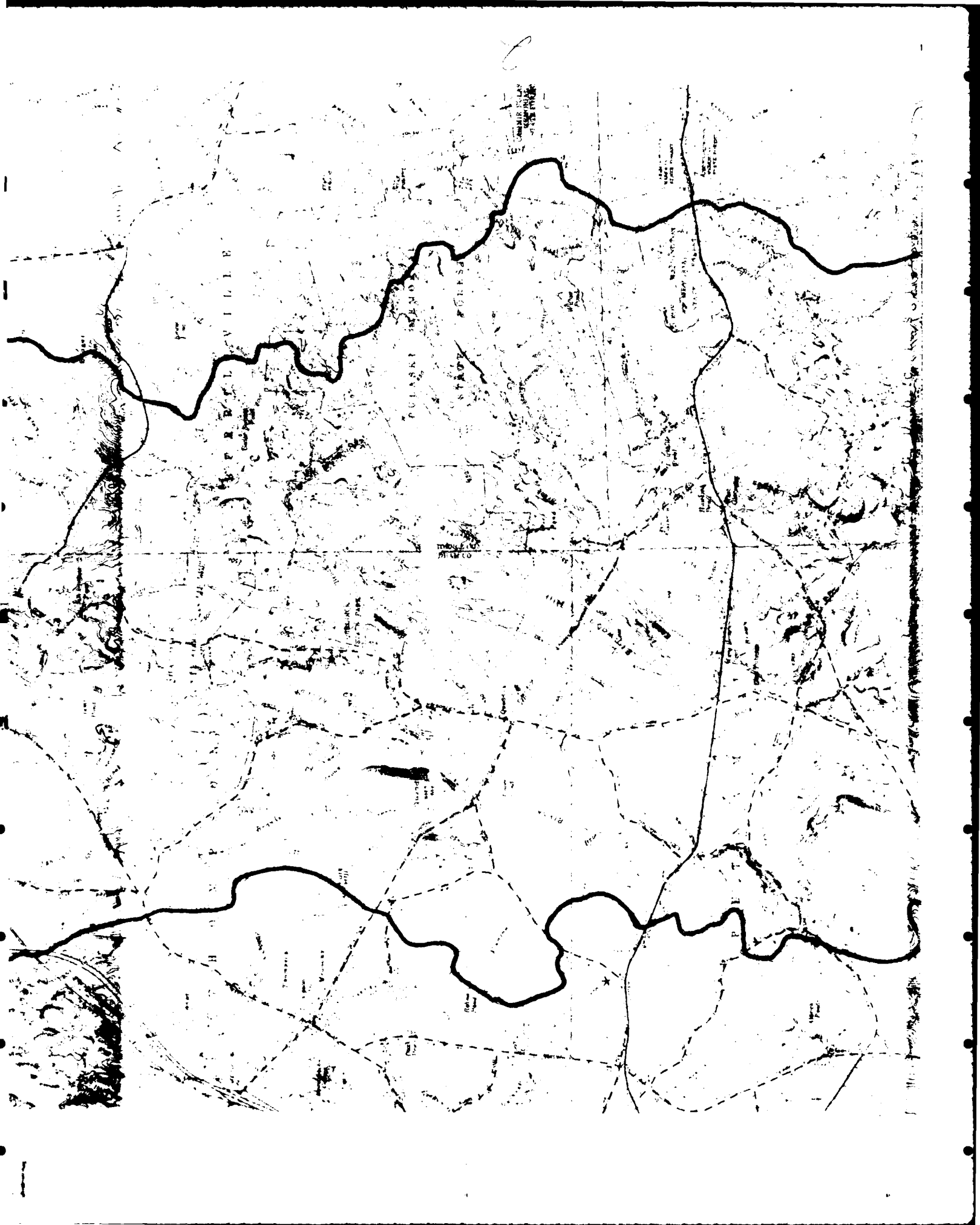
LIMIT OF IMPACT  
AREA

OLD DANIELS DAM  
DRAINAGE BASIN

Datum: NGVD  
Drainage Area: 51.2 sq. mi.  
USGS Quadrangle Sheets:  
Oxford, Mass.  
Thompson, Conn.  
Uxbridge, Mass.  
Chepachet, R.I.  
East Killingly, Conn.  
Clayville, R.I.

SCALE IN MILES

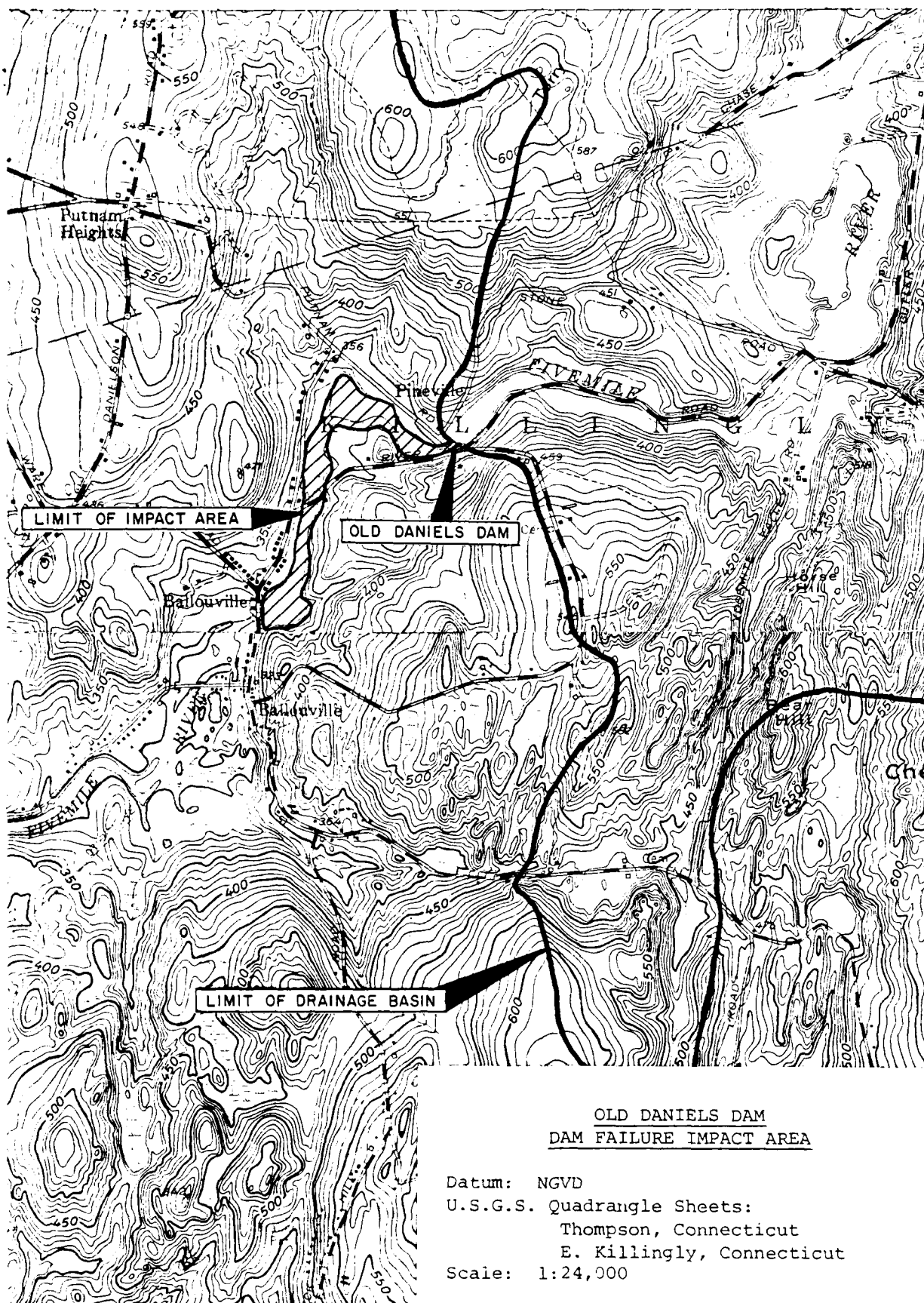






LIMIT OF DRAINAGE AREA

14



# OLD DANIELS DAM

## A. Size Classification

Height of dam = 18 ft.; hence SMALL  
 Storage capacity at top of dam (elev. 361.0) = 272 AC-FT.; hence SMALL  
 Adopted size classification SMALL

## B. Hazard Potential

The dam is classified as a SIGNIFICANT hazard potential structure because it's failure could result in loss of a few lives; inundation of 5-7 dwellings; one industrial establishment and 2 roads; and may cause disruption to public utilities. It is estimated that the failure discharge of 6748 CFS will travel downstream through the Five mile River streambed with velocities up to 31 feet per second. Water depths may range from 10-11 feet at a distance of 5,000 feet.

## C. Adopted Classifications

HAZARD	SIZE	TEST FLOOD RANGE
<u>SIGNIFICANT</u>	<u>SMALL</u>	<u>100 year to Half PMF</u>
Adopted Test Flood =	<u>Half</u> PMF =	<u>200</u> CSM
		= <u>10240</u> CFS

## D. Overtopping Potential

Drainage Area = 51.2 sq. miles  
 Spillway crest elevation = 358.0 NGVD  
 Top of Dam Elevation = 361.0 NGVD  
 Maximum spillway discharge  
 Capacity without overtopping of dam = 1920 CFS  
 "test flood" inflow discharge = 10240 CFS  
 "test flood" outflow discharge = 10150 CFS  
 % of "test flood" overflow carried by spillway without overtopping = 18.9  
 "test flood" outflow discharge portion which overflows over the dam = 8080 CFS  
 % of test flood which overflows over the dam = 81.1

Estimating Maximum Probable Discharges - Inflow and Outflow Values Date of Inspection: April 2, 1980

Name of Dam Old Daniels Dam ; Location of Dam Five Mile River ; Town Killbuck, Ct.

Watershed Characterization Swampy; natural storages; flat slopes ; 5.12 sq. miles of drainage area ; is swampy or occupied by storage reservoirs

Adopted "test" flood = Half PMF = 200 CSM = 10240 CFS; Re = Effective Rainfall = 9.5 inches

D.A. = Drainage Area (Gross) = 51.20 Square Miles; Basin Slope = 0.02 hence; Flat

S.A. = Surface Area of Reservoir = 0.05 Square Miles; Time of Concentration more than 3 hours minutes

Shape and Type of Spillway = Free vertical overflow; masonry with concrete capping

B = Width of Spillway = 112.0 feet; C = Coefficient of Discharge = (3.33-Friction) = 3.3

D  
1  
u

Maximum Capacity of Spillway Without Overtopping = 1920 CFS = 18.9 % of test flood outflow

Top of Dam Elevation = 361.0 ; Spillway Crest Elevation = 358.0

Overflow portion of Length of Dam = 200 ft. ; C = Coefficient of discharge for Dam = 3.0

Name of Dam	Test Flood		Inflow Characteristics		Outflow Characteristics First Approximation			Outflow Characteristics Second Approximation			Outflow Characteristics Third Approximation (Adopted)		
	Q <sub>p</sub> CSM	CFS	h <sub>0</sub> in feet	S <sub>0</sub> in in.	Q <sub>p1</sub> CFS	h <sub>1</sub> in ft.	S <sub>1</sub> in in.	S <sub>2</sub> in in.	h <sub>2</sub> in ft.	Q <sub>p2</sub> CFS	S <sub>3</sub> in in.	h <sub>3</sub> in ft.	Q <sub>p3</sub> CFS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
100yr = 70	3584		4.97	0.058	-	-	-	-	-	-	0.046	3.90	3400
1/2 PMF = 200	10240		8.76	0.102	-	SEE	PLATE	D-11	-	-	0.0764	6.53	10150

Q<sub>p</sub> = Discharge; h = Surge height; S = Storage in inches NOTE: Outflow discharge values are computed as per CDF guidelines.



NAME OF DAM: OLD DANIELS DAM

ESTIMATING EFFECT OF SURCHARGE STORAGE ON "TEST FLOOD"

A. This routing of floods through the reservoir was carried out according to the guidelines established by the Corps of Engineers in Phase 1 Inspection for Dam Safety Investigations issued in March, 1978.

B. Formulas used are as follows:

- i. For no overtopping:  $Q = C_1 B_1 h_1^{3/2}$   
For overtopping:  $Q = C_1 B_1 [h_2 + F.B.]^{3/2} + C_2 B_2 h_2^{3/2}$   
For open channel flow: N/A  
For orifice flow: N/A

where  $C_1$  = coefficient of discharge for spillway;  $B_1$  = length of spillway  
 $C_2$  = coefficient of discharge for dam;  $B_2$  = length of dam  
 $h_1$  = head over spillway crest (feet);  $h_2$  = head over dam (feet)  
F.B. = distance between spillway crest and top of dam

- ii. Surcharge storage in inches =  $S = 12 (h_1 + h_2) \frac{S.A.}{D.A.} = 0.0117$   
where S.A. = surface area  
D.A. = drainage area in sq. miles

- iii.  $Q_{outflow} = Q_{inflow} (1 - \frac{S}{Re})$ ; where  $Re$  = effective rainfall = 9.5"

- iv. Length of dam = 200 ft; Top of Dam elev. = 361.0; c for dam = 3.0  
Length of spillway = 112 ft; Spillway crest el. 358.0; c for spillway = 3.0

$$Q = 3.3 \times 112 (3 + h_2)^{1.5} + 3 \times 200 h_2^{1.5} \text{ where } h_2 \text{ is head over top of dam}$$

$$S = \text{storage in inches} = 12h \frac{S.A.}{D.A.} = 0.0117h \text{ where } h \text{ is head over spillway crest}$$

- v.  $Q_{inflow} = 1/2 \text{ PMF} = 10240 \text{ C.F.S.}$

Q in CFS	Elevation	Total Head over crest $h_1 + h_2 = h$	Storage in inches = S	Remarks
10202	361	3.0	0.0351	
10189	362	4.0	0.0468	
10177	363	5.0	0.0585	
10164	364	6.0	0.0702	
10152	365	7.0	0.0819	
10139	366	8.0	0.0936	
10150	364.53	6.53	0.0764	

"Rule of Thumb Guidance for Estimating  
Downstream Dam Failure Discharge"

BASIC DATA

Name of dam OLD DANIELS DAM Name of town KILLINGLY, CT.

Drainage area = 51.20 sq. mi., Top of dam 361.0 NGVD

Spillway type = overflow free vertical fall; Crest of spillway 358.0 NGVD  
Sharp crest

Surface area at crest elevation = 0.05 sq. mi. = 32 Acres

Reservoir bottom near dam = 344.0 NGVD

Assumed side slopes of embankments 2:1

Depth of reservoir at dam site 17.0 =  $y_0$  = 17.0 ft.

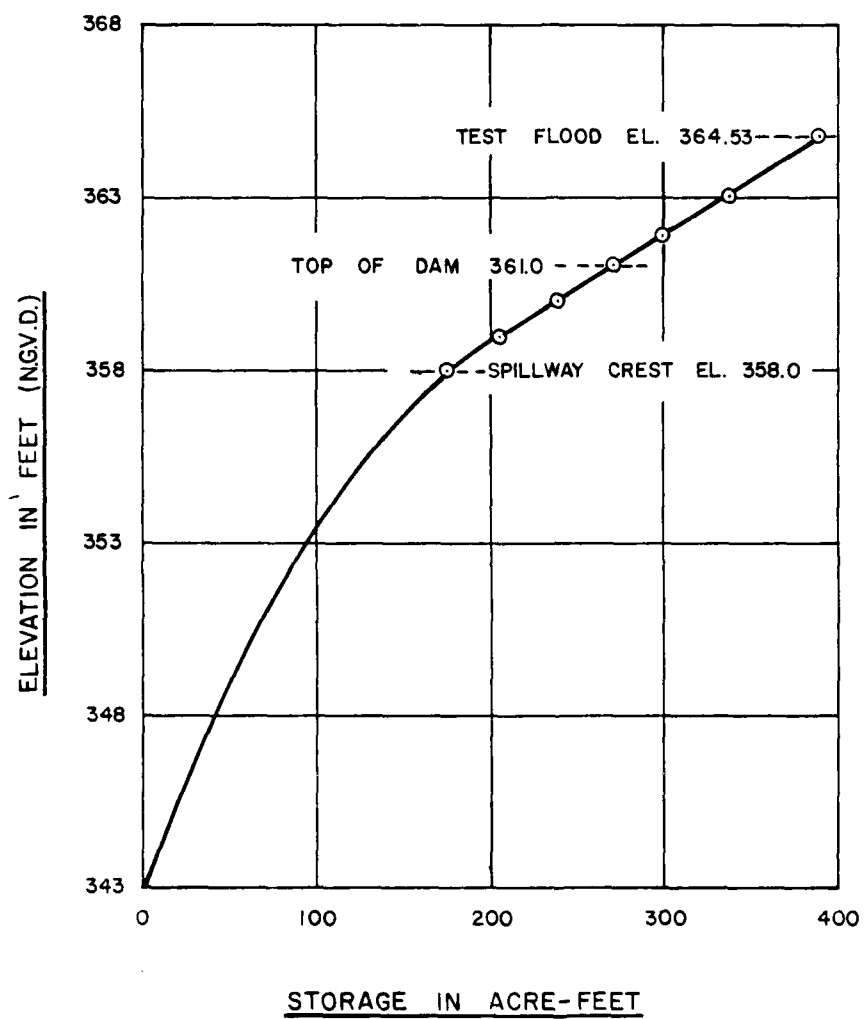
Mid-height elevation of dam = 352.5 NGVD

Length of dam at crest = overflow length 200 ft.

Length of dam at mid-height = 166 ft.

25% of dam length at mid-height =  $w_b$  = 41

Elevation (NGVD)	Estimated Storage in AC-FT
358.0	176 Spillway Crest Elevation
359.0	208
360.0	240
361.0	272 Top of Dam Elevation
361.90	330 100-year Flood Elevation
363.0	336
364.53	390 Test Flood Elevation



STORAGE-ELEVATION CURVE

OLD DANIELS DAM

PLATE D-6

# OLD DANIELS DAM

## 1. DAM FAILURE ANALYSIS

### A. Failure Analysis

$$\begin{aligned} \text{Discharge} &= \frac{8}{27} W_B \sqrt{g} y_o^{1.5} \\ &= 1.68 W_B y_o^{1.5} \\ &= 4828 \text{ C.F.S.} \end{aligned}$$

C.F.S.

### B. Maximum Spillway

Discharge with W.S.E.

At top of Dam @ 361.0

1920 C.F.S.

### C. Total Dam Failure Discharge

6748 C.F.S.

### D. Reservoir - Storage Data:

Volume of storage at spillway crest = 176 AC-ft. @ Elev. 358.0

Surcharge storage at top of dam = 96 AC-ft. @ Elev. 361.0

Storage Total = 272 AC-ft. @ Elev. 361.0

### E. Flood Discharge Channel

i. Maximum depth of flow just D/S of Dam =  $\frac{4}{3}y_o = 7.5$  feet

## Notes:

1. Failure of dam is assumed to be instantaneous. When pool reaches top of dam, and is a full-depth partial width rectangular shape failure with a width of failure =  $W = 41.0$  feet and depth of failure  $y_o = 17.0$  feet.
2. Steady, uniform flow phenomenon is assumed for determination of failure profile and is based on Manning's formulae.
3. Failure profile for impacted area determination is determined at three typical cross sections in the downstream channel. Reduction in discharge due to available storage has been taken into account.

ii. Reach 1

Length = 2000 feet; Station 0 to Station 20+00;  $n = 0.05$

Bed slope =  $S_o \approx S_f = 0.0085$ ; Bed width =  $b = 46.6$  feet

Bed width is scaled from U.S.G.S. map; scale 1" = 2,000 feet

As bed width is large and 1" = 2,000 feet and 10-foot contour interval scale maps are being used for various channel parameters, it is appropriate to assume that  $d = R = \text{Hyd Radius} = \text{depth}$ , hence Manning's formulae is transformed:

$$Q = A \frac{1.49}{n} R^{2/3} \sqrt{S} = bd \frac{1.49}{n} d^{2/3} \sqrt{S}$$

$$Q = b \frac{1.49}{n} \sqrt{S} d^{5/3} = Kd^{5/3} = 128 d^{5/3}$$

State Discharge Relationship for Reach 1

Depth = d in Feet	Stage of Elevation	Discharge in CFS = Q	Velocity in ft./sec.	Storage Volume in AC-ft. = V
0	330	0	0	0
2	333	406	4.72	4.0
4	334	1288	7.48	8.0
6	336	2532	9.81	12.0
8	338	4090	11.88	16.0
10	340	5932	13.80	20.0
12	342	8037	15.57	24.0

F. Water surface profiles resulting from maximum spillway discharge and also from dam failure discharge are shown on Plate D-12 for comparison purposes. This figure also shows the rise in water depth due to failure of dam.

Also, Discharge -- Depth and Storage-depth curves are shown on Plate D-13 for downstream channel.

Notes: 1. Storage volume in AC-ft =  $\frac{(\text{Length of Reach}) (\text{Bed Width}) (\text{Depth})}{43,560}$

2. Failure discharge being large will mostly be overbank flow on existing channel.

G. For  $Q_1 = 6748$  CFS; depth = 10.8 ft.  $V_1 = 22$  AC-ft.

$$\text{Trial } Q_2 = Q_1 \left(1 - \frac{V_1}{\text{Storage}}\right) = Q_1 \left(1 - \frac{22}{272}\right) = 6202 \text{ CFS;}$$

$$V_2 = \text{AC-ft.}$$

$$\text{Avg } V = \frac{V_1 + V_2}{2} = 21.5 \text{ AC-ft.}$$

$$Q_2 = Q_2 \left(1 - \frac{V \text{ Avg.}}{\text{Storage}}\right) = 6215 \text{ CFS; } y_2 = 10.2 \text{ ft.}$$

Depth at center of flood as adopted = 10.2 ft.

### iii. Reach 2

Length = 3000 feet; Station 20+00 to Station 50+00;  $n = 0.05$

Bed slope =  $S_o \approx S_f = 0.0045$ ; Bed width =  $b = 71.6$  feet

Bed width is scaled from map of scale 1" = 2,000 feet

As bed width is large and 1" = 2,000 feet and 10-foot contour interval scale maps are being used for various channel parameters, it is appropriate to assume that  $d = R = \text{Hyd Radius} = \text{depth}$ , hence Manning's formulae is transformed in this case to with channel parameters adopted as before.

$$Q = A \frac{1.49}{n} R^{2/3} \sqrt{S} = b d \frac{1.49}{n} d^{2/3} \sqrt{S}$$

$$Q = b \frac{1.49}{n} \sqrt{S} d^{5/3} = K d^{5/3} = 143 d^{5/3}$$

### Stage Discharge Relationship for Reach 2

Depth = d in Feet	Stage of Elevation	Discharge in CFS = Q	Velocity in ft/sec	Storage Volume in AC-ft = V
0	324	0	0	0
2	326	453	3.77	8.25
4	328	1440	6.00	16.50
6	330	2829	7.86	24.75
8	332	4570	9.82	33.00
10	334	6627	11.05	41.25
12	N/A			

G. For  $Q_1 = 6215$  CFS; depth = 10.20 ft.  $V_1 = 20.5$  AC-ft.

$$\text{Trial } Q_2 = Q_1 \left(1 - \frac{V_3}{\text{Storage}}\right) = Q_1 \left(1 - \frac{20.5}{272}\right) = 5704 \text{ CFS}$$

$$\therefore V_2 = 38 \text{ AC-ft.}$$

$$\text{Avg } V = \frac{V_1 + V_2}{2} = 29.25 \text{ AC-ft.}$$

$$Q_2 = Q_1 \left(1 - \frac{V \text{ Avg.}}{\text{Storage}}\right) = 5546 \text{ CFS; } y_2 = 9.50 \text{ ft.}$$

Depth at center of flood as adopted = 9.85 ft.

Additional dam failure analysis beyond Reach 1 has not been undertaken because the depth of flow of 9.85 feet at the end of Reach 1 will not cause any hazardous conditions further downstream. The failure discharge and depth will continually decrease beyond Reach 2,

SUMMARIZED AND ADOPTED VALUES

FOR

DAM FAILURE ANALYSIS

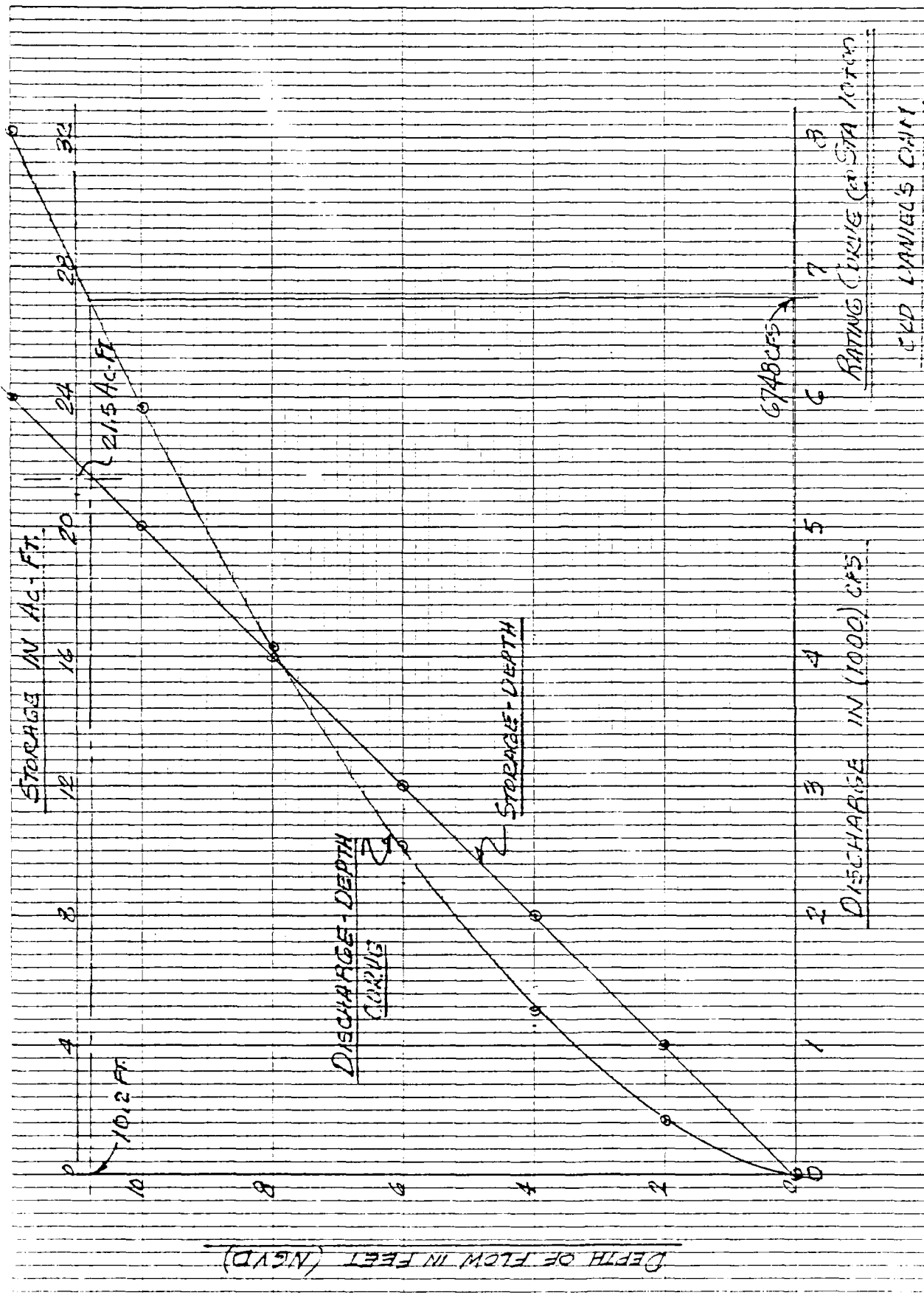
- i. Name of Dam OLD DANIELS DAM
- ii. Dam Failure Discharge                      = 4828 cfs.
- iii. Maximum Spillway Discharge                      = 1920 cfs.
- iv. Total Dam Failure Discharge                      = 6748 cfs.
- v. Normal (Manning Depth) for 6748 CFS = 10.2 feet for first 2000 feet
- vi. Normal (Manning Depth) for 5340 CFS = 8.0 feet for next 3000 feet  
\* see below
- vii. Increase in depth due to failure of dam = 6.0 feet
- viii. W.S.E. prior to failure = Ground Elevation + spillway discharge depth.
- ix. W.S.E. after failure = Ground Elevation + Dam failure depth.

Note: The adopted depth of flow values are assumed to be accurate representations of damages in the impacted areas. Professional judgement is used in these final adopted values.

- \* Normal (Manning Depth) for 1920 CFS = 4.8 feet for first 2000 feet.  
Normal (Manning Depth) for 450 CFS = 2.0 feet for next 3000 feet.







# OLD DANIELS DAM

## COMPUTATIONS FOR SPILLWAY RATING CURVE AND OUTLET RATING CURVE COMPUTATIONS

Spillway width = 112 feet; Spillway crest elevation = 358.0 NGVD  
 Overflow  
 Length of dam = 200 feet; Top of dam elevation = 361.0 NGVD  
 c = 3.3 for spillway and 3.0 for dam

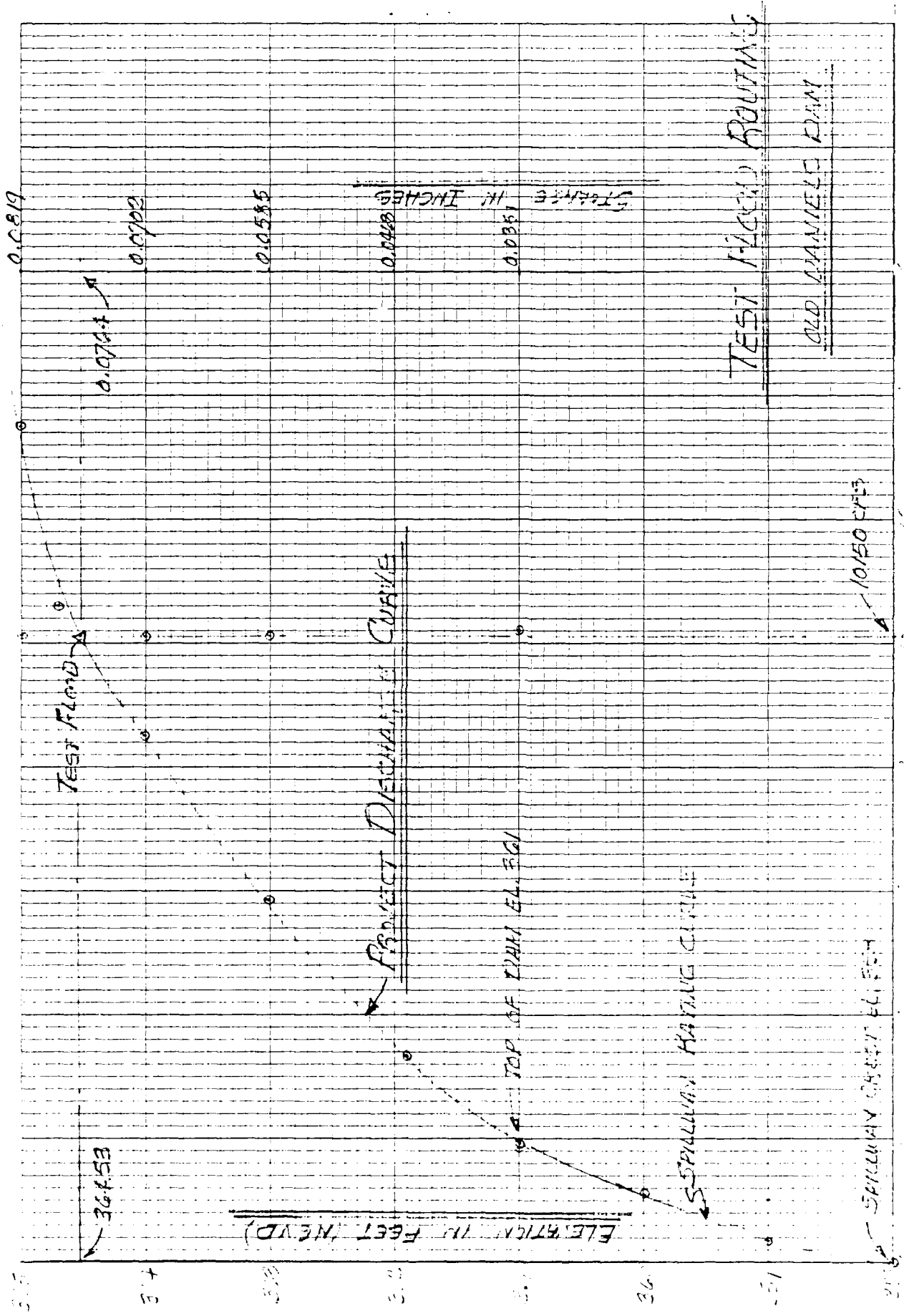
### i) SPILLWAY RATING CURVE COMPUTATIONS

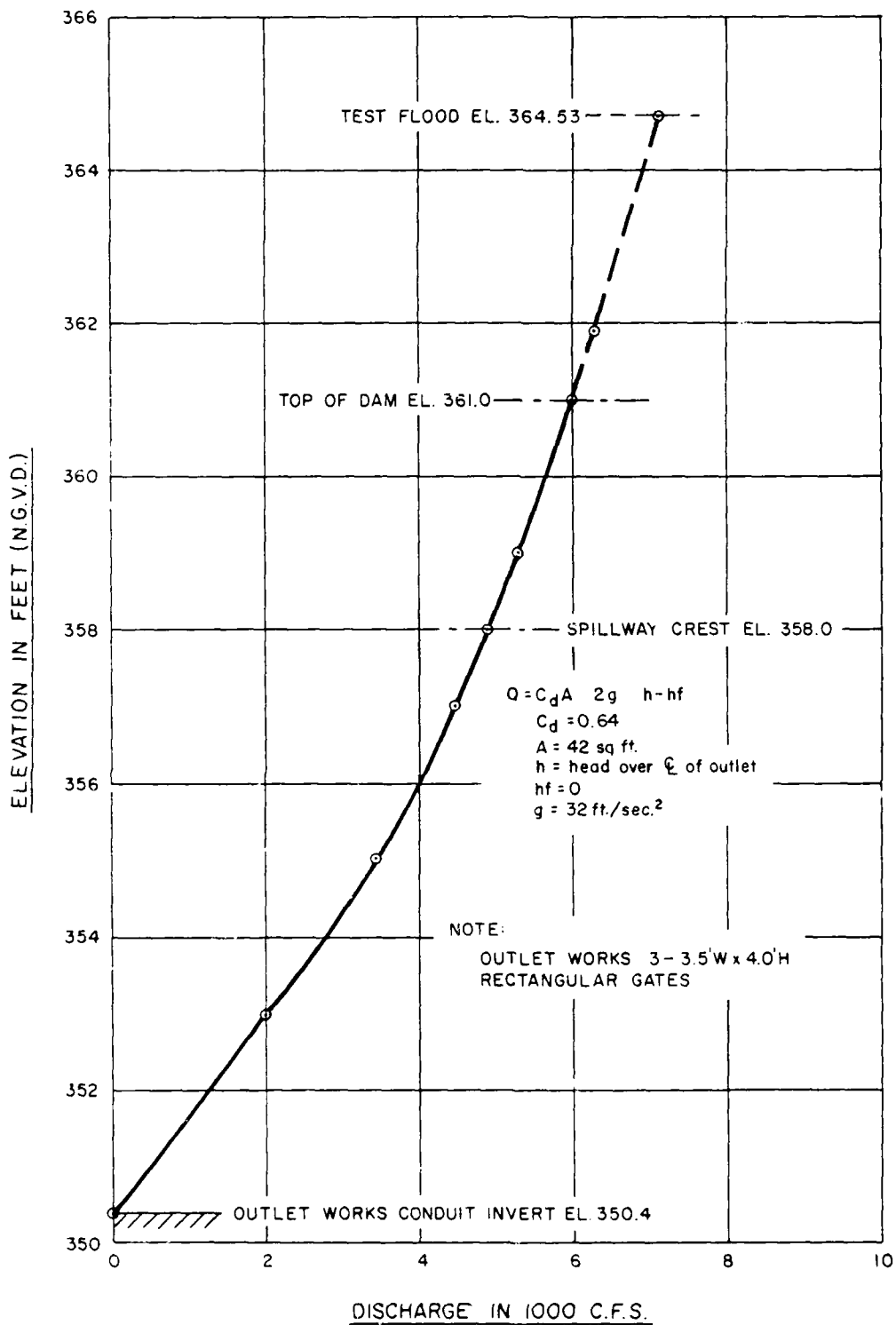
Elevation (ft.) NGVD	Spillway Discharge (CFS)	Remarks
358.0	0	Spillway Crest Elevation
359.0	370	
360.0	1045	
361.0	1920	Top of Dam Elevation 100-year Flood Elevation
361.9	3360	
363.0	5829	
364.0	8549	
364.7	10680	
365.0	13553	

### ii) OUTLET RATING CURVE COMPUTATIONS

Elevation (ft.) NGVD	Discharge (CFS)	Remarks
350.4		Invert of Outlet Elevation
353.3	200	
355.0	346	
357.0	447	
358.0	490	Spillway Crest Elevation
359.0	529	
361.0	600	Top of Dam Elevation 100-year Flood Elevation
361.9	629	
364.53	713	

Size of outlet = 3-3.5'W x 40'H ; Area of outlet = 42.0 sq. ft.  
 Invert of outlet = 350.40 ; Center line of outlet = 352.40





OUTLET RATING CURVE  
OLD DANIELS DAM

APPENDIX E

INFORMATION AS CONTAINED IN THE  
NATIONAL INVENTORY OF DAMS

CITY DIVISION STATE COUNTY DISTRICT

NAME

LATITUDE LONGITUDE REVISION DATE  
DEGREE MINUTE SECOND DAY MONTH YEAR

POPULAR NAME

NAME OF IMPROVEMENT

PROJECT NAME

RIVER OR STREAM

NEAREST DOWNSTREAM  
TOWN OR CITY

POPULATION

TYPE OF DAM

YEAR  
COMPLETED

PURPOSES

PROJECT TO CAPACITIES

REMARKS

OWNER

DESIGNER

CONSTRUCTION

OPERATION

MAINTENANCE

INSPECTION BY

INSPECTION DATE

DAY MONTH YEAR

AUTHORITY FOR INSPECTION

REMARKS

NAVIGATION LOCKS

REMARKS

**END**

**FILMED**

8-84